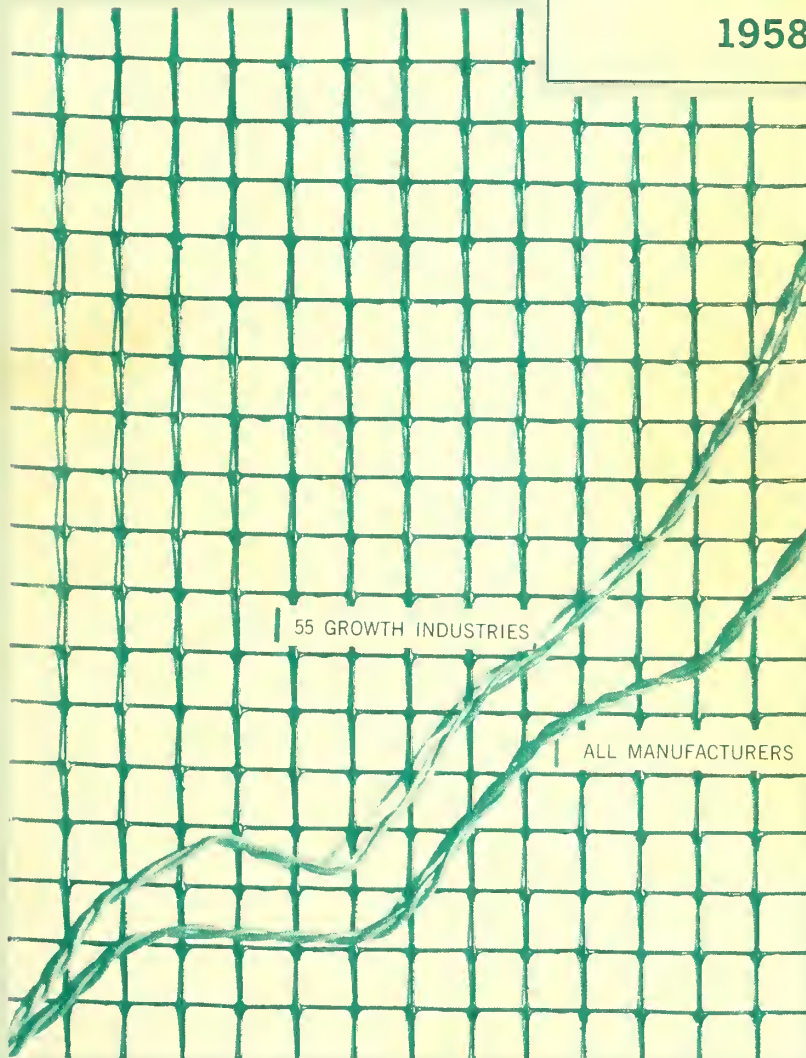


241.2: P11



Growth Pace Setters in American Industry

1958-1968



Growth Pace Setters in American Industry

1958-1968



U.S. DEPARTMENT OF COMMERCE

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Foreword

Manufacturing activity in the United States has experienced a strong growth pattern in the decade since 1958. "Pace Setters" is both a statistical and narrative presentation covering 55 of those industries whose growth contributed significantly to the favorable overall performance. This publication highlights the more important factors which have influenced each industry's growth, and evaluates those which are likely to affect future trends. Basic statistics are supplied for output, employment, value added, wages, payroll, geographic dispersion, concentration, and foreign trade. Much of the data presented here is based on published Bureau of Census materials. However, the 1967 and 1968 entries for some series are estimates prepared by BDSA.


The Office of Industrial Analysis and Business Programs under Davis A. Portner, Assistant Administrator, BDSA, and Thomas E. Murphy, Special Assistant to the Assistant Administrator, was responsible for the overall planning and preparation of this volume. Technical contributions to the narrative text and statistical tables were made by staff members of the Industry Divisions under the supervision of Charley M. Denton, Assistant Administrator for Industry Operations. Technical and editorial work was the responsibility of Elsie S. Dorman with the assistance of Jill Kugler. Statistical work was under the direction of David N. Cohen, Director, Statistical Operations and Analysis Staff.

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Introduction

The population of the United States increased from 175 million to over 200 million during the past ten years; employment has grown to more than 75 million and wages and salaries have increased 90 percent to \$460 billion.

All these have been combined to create a rapidly rising effective demand for goods and services, best reflected in the growth of personal consumption expenditures from \$290 billion in 1958 to about \$530 billion ten years later. Other components of the Gross National Product have risen rapidly with Gross Private Domestic Investment up from \$60 billion to \$125 billion and Federal Government purchases up from \$94 billion to almost \$200 billion.

The pace setters of U.S. industry have been able to obtain an important portion of these increases in demand either due to new or improved products, favorable prices, cost saving devices, or other factors which provide more consumer satisfaction.

The pace setters of U.S. industry have demonstrated more explosive growth during the past ten years than the average of all manufacturing industries. This growth is due to an invigorating economic climate which resulted in a large increase in demand for goods and services, but more specifically it is the result of certain factors which have made the pace setters expand more rapidly.

There are unique factors applying to individual industries, but there are certain common traits which occur again and again in many of the pacesetting industries.

The improvement of technical processes, which results in new or lower costs products, is most apparent in the rapidly growing industries. Research and development expenditures usually precede growth products and, during, the past 15 years, the major areas of research and development have been: (1) guided missiles and spacecraft, (2) communication equipment and elec-

tronic components, (3) aircraft and parts, (4) machinery, (5) industrial chemicals, (6) motor vehicles and other transportation equipment, (7) atomic energy devices, (8) professional and scientific instruments, (9) drugs and medicines, and (10) petroleum refining and extraction.

Not surprisingly, most of the rapidly growing industries are in the areas of electrical machinery and equipment, other machinery, transportation equipment, chemicals and chemical products, and professional, scientific and controlling instruments.

Government actions, both at the macro-economic level of fiscal and monetary policies and at the micro-economic level of specific spending and legislation, contribute to the growth of individual industry groups. Changes in the tax laws and credit availability affect the growth of several capital goods producing industries, particularly in the machinery and industrial equipment area. Changes in building codes by several local governments opened up new materials to the construction industries. The interstate highway program affects not only the producers of highways, building materials, but also manufacturers of transportation and construction equipment and suppliers of materials and products to the transportation industries.

Defense spending, always a major Federal Government component, affects several industries.

Either directly or indirectly, U.S. Government actions affect the growth rate of virtually every manufacturing industry in the United States.

The future pace setters of American industry will include many of the industries which have prevailed during the past ten years plus some newcomers with products to meet the changing needs of society.

During the next ten years, population should increase to 230 million, Gross National Product will be approaching \$1.5 trillion, and about half

of all American families will be earning \$10,000 or more per year. The approach to solving many public problems such as transportation, utility needs, and housing will affect the growth of several industries.

The amount spent on automotive verses railroad transportation, for example, will give impetus to growth in different industries; likewise develop-

ments in possible requirements for housing will affect producers of different construction materials.

Increased leisure and more discretionary spending will cause accelerated growth in several industries, depending upon the tastes of consumers. The pace setters of the future will be those industries which develop and have available the products to satisfy the needs of consumers.

Aircraft

SIC 3721

The aircraft industry, during the past 10 years, has experienced a period of unparalleled technological growth. A series of continuously improved aircraft were designed, produced, and delivered to the military services, the airlines, and private and business operators throughout the free world. Probably one of the most dramatic advances was the evolution of the commercial jet transport, which revolutionized air transportation throughout the world.

While the total value of shipments of the aircraft industry increased by more than 67 percent during the past 10 years, civilian aircraft shipments in 1967 were more than five times larger than in 1958. Commercial transport aircraft have registered the largest increase during this period. The free world's commercial airfleet, numbering 4,600 aircraft in 1958, increased by May 1968 to 6,500 aircraft, of which 76 percent are U.S.-built. U.S.-built aircraft account for 83 percent of the 3,716 jet aircraft ordered by the free world's airlines between 1958 and May 1968.

General aviation, which includes all flight operations other than military and airlines, has grown rapidly during 1958-67. Actual production of general aviation aircraft has declined for several years, but unit and dollar volume have shown a long-range upward trend. These aircraft have grown from 67,839 units in 1958 to 112,000 in 1967, an increase of over 65 percent, and make up 73 percent of the civil airfleet. The general aviation fleet is primarily piston-powered, however, by the end of 1967, more than 1,500 turbine-powered business aircraft had been delivered—740 turbojets and 807 turboprops.

Military production continues to dominate the rotary-wing aircraft industry. Production has

registered an upward trend, however, in both military and civilian sectors. Commercial helicopter operations continue to rise with more than 1,000 operators in business by the end of 1967 compared to less than 300 in 1958. The civil helicopter fleet has increased from about 900 aircraft to more than 2,000 during the past 10 years.

The production of military aircraft provides an essential developmental base for the aircraft industry. During most of the past 10 years, unit production was on the decline although the value of production held at around \$3 billion. The general downtrend in shipments has been reversed by requirements for the conflict in Vietnam. In 1966 and 1967, shipments were considerably higher than in any other year since 1960.

GROWTH FACTORS

The growth of the aircraft industry is dependent upon the continued development of lightweight, high-strength airframe structures and of lightweight, high-power engines. The interdependent development of new materials and new engines has brought into being new aircraft with more speed, more range, more payload, more reliability, and more safety.

The evolution of the commercial jet airliner was the result of advances in aeronautical technology, not because of requirements generated by the airlines. The jet transport has become the source of the airlines' rapid growth and that growth generates new demands for new generations of transport aircraft.

All branches of aviation have shared in the benefits of aeronautical technological progress.

The growth of the general aviation airfleet is an indication of the increasing effectiveness of single-engine and twin-engine lightplanes as rapid, versatile transportation for business and pleasure. Traditionally, general aviation aircraft manufacturers have sought to keep the cost of new technology and increased aircraft performance within a level acceptable to general aviation. These efforts have led to many advances in the state of the art of developing numerous models of general aviation aircraft.

The growth of the helicopter industry is a result of their use in Korea and in Vietnam. Military experience has generated civilian interest in rotorcraft and their success as versatile instruments of tactical warfare has expanded their military demand. Military usage has produced tens of thousands of trained helicopter pilots and mechanics, and provided experience in operating helicopters under adverse conditions, and improved performance and reliability.

Another important factor in U.S. aircraft production is the substantial growth in exports to foreign countries, largely of the civilian transport types. While the value of exports of military aircraft has remained relatively constant during the past 10 years, growth in civilian exports has been dramatic. Civilian aircraft exports amounted to approximately \$205 million in 1958 and are expected to reach over \$1 billion in 1968.

The largest single export item in 1967 was \$508 million of passenger transports. Large aircraft of the passenger/cargo type were also sold in substantial volume. Sales to foreign countries of general aviation aircraft, as well as rotary-wing aircraft, are also significant.

While the United States is a net exporter of aircraft by a wide margin, our imports since 1958 have been growing. Imports of \$32.7 million in 1958 increased to \$61.1 million in 1967. The U.S. imports a very few large transport type aircraft (33,000 pounds category), with the balance of imports in executive jet types and military utility and liaison aircraft.

The accomplishments of the aircraft industry are due in large part to the willingness of the industry to invest large sums in research and development and in plant and equipment, to achieve great advances in technology.

For example in the 1958-67 period, the number of scientists and engineers in research and development in the aircraft and missiles industry increased by over 68 percent, while total scientists and engineers in research and development increased about 51 percent, according to National Science Foundation data. Similarly during the 9-year period 1958-66, the industry invested \$1.2 billion in new plant and equipment, \$378 million in 1966 alone.

FUTURE PROSPECTS

The long-range outlook for the aircraft industry is very favorable. The research programs of the past few years have provided the base for new progress in aircraft performance. Advances in aeronautical technology will improve the usefulness of all types of aircraft—military, airline, and general aviation.

In order to meet the needs of the continued expansion of domestic and international air transportation, the industry launched production of a new generation of large-capacity passenger and cargo transports, and is engaged in the final stages of development of an operational supersonic transport. Post-Vietnam military requirements will generate new development programs for the modernization of the aircraft inventory. The rapid expansion of the helicopter airfleet and the mass production in all shapes and sizes for Vietnam can be expected to generate a sharp upswing in civilian demand. General aviation industry leaders predict their sales will exceed \$1 billion in the next 5 years, or more than double the current level.

Foreign competition cannot be discounted, however, and the European aircraft industry can be expected to strengthen its efforts in worldwide marketing of executive jets and short- to medium-range jet airliners. The European industry may eventually develop an intra-European consortium of specialized aircraft producing groups.

U.S. aircraft should dominate the world market for a long time to come as a result of the reliability, maintainability and economy of operation, which are characteristic of U.S.-produced aircraft. U.S. aeronautical production technology is the most advanced in the free world and the continued development of new capability is our most competitive force.

**Table 1a.—General Statistics
Aircraft—SIC 3721**

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	377,383	2,340,306	251,249	508,195	1,334,705	3,399,163	6,438,067	94,167	2.547	2.626
1959.....	369,253	2,419,610	225,581	461,834	1,248,162	3,305,013	6,808,666	89,605	2.648	2.703
1960.....	302,428	2,084,943	177,567	366,374	1,043,943	3,044,749	5,920,180	62,755	2.917	2.849
1961.....	305,435	2,205,508	172,942	351,726	1,023,524	3,046,923	6,000,080	71,816	2.977	2.910
1962.....	326,140	2,468,712	180,369	378,192	1,131,358	3,363,486	6,205,647	119,655	2.973	2.991
1963.....	302,201	2,190,498	166,744	342,120	1,016,590	3,542,695	6,316,531	114,658	3.485	2.971
1964.....	283,532	2,328,676	159,609	327,713	1,220,534	3,416,917	6,584,263	102,858	2.800	3.724
1965.....	295,099	2,378,659	172,334	351,044	1,169,330	3,730,817	7,150,896	140,501	3.191	3.331
1966.....	357,218	3,221,758	209,279	435,002	1,527,930	4,674,598	9,000,074	378,435	3.059	3.512
1967.....	² 360,900	N.A.	N.A.	N.A.	N.A.	N.A.	² 9,900,000	N.A.	N.A.	N.A.
1968.....	² 360,600	N.A.	N.A.	N.A.	N.A.	N.A.	² 10,800,000	N.A.	N.A.	N.A.

¹ Represents value of work done.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 1b.—Value of Shipments
Aircraft—SIC 3721**
[Dollars in thousands]

Year	Total	Transport	General average	Rotorcraft
1958.....	\$500,540	372,187	102,141	26,212
1959.....	899,637	727,527	147,585	24,525
1960.....	1,240,978	1,047,701	177,213	16,064
1961.....	904,498	737,306	151,302	15,890
1962.....	876,748	692,761	156,816	27,171
1963.....	642,304	425,840	174,201	42,263
1964.....	1,065,323	784,386	236,859	44,078
1965.....	1,575,578	1,145,888	379,772	49,918
1966.....	2,092,718	1,590,204	473,171	29,343
1967.....	¹ 2,758,000	¹ 2,300,000	¹ 416,000	¹ 42,000

¹ Estimated.

Source: FAA Statistical Handbook of Aviation and BDSA.

**Table 2a.—Foreign Trade
Aircraft—SIC 3721 Civilian**
[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$204.8	N.A.	\$500.5	40.9	N.A.
1959.....	153.7	N.A.	899.6	17.1	N.A.
1960.....	537.1	N.A.	1,240.9	43.3	N.A.
1961.....	339.6	N.A.	985.3	34.4	N.A.
1962.....	323.4	N.A.	981.7	32.9	N.A.
1963.....	244.1	\$19.5	689.1	35.4	2.7
1964.....	287.3	3.2	1,066.1	26.9	.3
1965.....	477.2	64.8	1,577.3	30.2	3.9
1966.....	552.4	151.3	2,087.0	26.4	6.7
1967.....	812.9	59.4	² 2,981.5	² 27.2	² 1.9
1968.....	² 1,033.9	² 77.1	² 4,052.0	² 25.5	² 1.8

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2b.—Foreign Trade
Aircraft—SIC 3721 Military**
[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	N.A.	N.A.	\$5,365.3	N.A.	N.A.
1959.....	N.A.	N.A.	5,101.0	N.A.	N.A.
1960.....	N.A.	N.A.	3,384.4	N.A.	N.A.
1961.....	N.A.	N.A.	2,087.1	N.A.	N.A.
1962.....	N.A.	N.A.	2,314.8	N.A.	N.A.
1963.....	N.A.	\$7.8	2,357.0	N.A.	0.3
1964.....	N.A.	17.0	3,712.0	N.A.	.4
1965.....	\$303.5	8.5	2,900.0	10.4	.3
1966.....	220.9	11.2	3,900.0	5.6	.3
1967.....	274.7	1.7	² 5,400.0	² 5.1	² .03
1968.....	² 304.0	² 2.4	² 4,600.0	² 6.6	² .05

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Aircraft—SIC 3721**

United States buys from—	United States sells to—
Canada	Canada
United Kingdom	United Kingdom
West Germany	West Germany
Japan	France
France	Japan
	Sweden
	Australia
	Italy
	Spain

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Aircraft—SIC 3721**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments
1958.....	127	377,383	¹ \$6,438	45	346	¹ \$4	40	1,739	¹ \$23	42	375,298	¹ \$6,411
1963.....	100	302,201	¹ 6,317	35	199	¹ 3	19	975	¹ 11	46	301,027	¹ 6,303

¹ Represents value of work done.

Source: Bureau of the Census.

**Table 5.—Key Ratios
Aircraft—SIC 3721**

Item	1958	1963
Investment per production worker.....	¹ \$2,118	\$5,794
Specialization ratio (%).....	^r 81	69
Concentration ratios (%):		
4 firms.....	59	59
8 firms.....	83	83
20 firms.....	99	99
50 firms.....	99+	99+

^r Revised.

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution
Aircraft—SIC 3721**

Geographic area	All employees	Geographic area	All employees
Total.....	302,201	South.....	59,578
North East.....	59,582	Maryland.....	207
North Central.....	50,504	Texas.....	28,808
		West.....	132,537

Source: Bureau of the Census.

**Table 7.—Principal Products
Aircraft—SIC 3721**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Complete aircraft, military type.....	3,502	2,820	2,395	2,087	2,315	2,470	2,566	2,657	3,563	1.02
Complete aircraft, personal and utility type.....	N.A.	N.A.	N.A.	292	268	158	226	337	405	N.A.
Complete aircraft, commercial transport type.....	N.A.	N.A.	N.A.	969	786	561	836	1,275	1,772	N.A.
Modifications, conversions, and overhaul of aircraft.....	299	260	362	327	369	465	344	413	453	1.52
Other aeronautical services for aircraft.....	574	776	626	796	701	668	683	590	687	1.20
Aircraft, N.S.K.....	0	0	0	0	0	7	5	5	5	N.C.

N.C. = Not computed.
N.A. = Not available.

N.S.K. = Not specified by kind.

Source: Bureau of the Census.

Automatic Vending Machines

SIC 3581

The automatic vending machine industry has in the past few years helped lead a revolution in retailing that is affecting increased numbers of consumers every day. Over 3 million persons now buy at least one meal a day from vending machines. Millions more depend on them for cigarettes and soft drinks. The performance of the industry in meeting the public's desire for convenient methods of purchasing simple items is shown by a more than 125-percent increase in the value of vending machine shipments and a doubling of employment in the industry in the period 1958-68.

GROWTH FACTORS

Retailing through a mechanical device first became popular in the United States in the late 1800's when chewing gum dispensers were installed on New York City's elevated railroad platforms. Gradually the range of items vended was increased, but by 1940 automatic selling had yet to establish a permanent position on the retail scene. World War II, however, provided the impetus for growth.

As the industrial workday increased to 10 and 12 hours, defense plant management realized that worker productivity would suffer without refreshment breaks to rekindle energy and interest in the job. Vending machines were soon acknowledged to be the best sources of these refreshments. Because of the short supply of manpower and the Government's curtailment of vending machine manufacturing, many units were taken from retail outlets and placed in the defense plants. Thousands of workers thereby became accustomed to getting their cigarettes, coffee and candy from a machine.

Vending machine operations in competition with company subsidized cafeterias became a real possibility.

However, in order to capitalize on the habits developed and lessons learned during the war, the industry had to increase the number of products that could be vended and change the starkly functional appearance of its equipment. The manufacturers' success in achieving both these objectives has contributed greatly to the growth in demand for vending machines.

Numerous technological advances have made possible the vending of the many items now available in automatic merchandising machines. For example, heating and refrigeration units have permitted the dispensing of hot and cold foods. The multiselection cigarette machines have been developed to accommodate the many different brands of cigarettes. The introduction of crushed ice to the machines created a boom in the soft drink cup business.

Stainless steel is now widely used for such interior soft drink components as carbonators and sirup tanks because minute food particles cannot lodge in the hard smooth surface. Nickel stainless steel is used in delivery chutes to prevent corrosion from the acids of carbonated beverages. The most recent technological advances have made possible the offering of complete meals by machine. Infrared and microwave ovens are being used for heating refrigerated meals in seconds.

The vending industry is not only involved in broadening the scope of its services, but also in designing machines that will fit smoothly into the modern, tastefully decorated surroundings of universities, libraries, department stores, etc. Vending companies are working with manu-

facturers to produce machines with contemporary lines that blend into their setting and also project a unified appearance when grouped.

These technological and design advances have taken place at a time when changes in America's economic and social environment have made the consumer most receptive to automatic vending. The population is increasing steadily, especially in suburbia, where the desire for more convenience in location and time of purchase makes vending more appealing. The sprawling one-story suburban assembly line industrial plant has replaced the two- or three-story downtown loft building, creating a large market virtually isolated from the restaurants, cafeterias, and snack bars found in the city. Satisfying the food needs of thousands of workers has in numerous instances been recognized as too large and uneconomical a task for company cafeterias. Instead, vending machines are used to augment or totally replace the cafeteria in modern industrial plants.

Labor costs in personal selling activities have been sharply increasing in recent years, making machine selling an ever more attractive alternative. Finally, the trend toward impulse buying by persons with rising disposable incomes has helped sustain and expand the vending market.

FUTURE PROSPECTS

The technological, design, economic, and social factors responsible for past growth in the automatic vending machine industry can be expected to continue to exert expansion pressure in future years. The consumer is becoming more receptive to vending but the manufacturers must continue to make technological advances to take advantage of the growing market. Especially helpful in this regard will be the survivors of the widespread industry consolidation movement in the early 1960's. These larger companies have the financial resources for funding the needed research and development efforts.

Potential markets for vending services should continue to expand. Over 50 million students now attend elementary and secondary schools and colleges. It has been estimated that by 1980, with continued growth in enrollments, 1 billion meals will be served during the normal school year of 180 days. The total food market by 1980 could easily be in the \$20 to \$25 billion range. The ability of the vending machine industry to penetrate the school market and to develop the range of food services necessary to serve the remainder of the varied food market will be the major determinants of its future growth.

**Table 1.—General Statistics
Automatic Vending Machines—SIC 3581**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	7,894	37,049	5,557	10,846	21,945	64,694	141,635	2,798	2.948	2.023
1959.....	8,588	42,073	6,284	12,726	26,286	83,493	165,197	2,452	3.176	2.066
1960.....	10,990	56,834	8,102	16,412	37,000	123,584	213,581	3,542	3.340	2.254
1961.....	11,134	57,893	7,709	15,329	34,043	96,507	201,326	2,681	2.835	2.221
1962.....	13,378	71,524	9,482	18,285	42,362	130,772	247,542	6,364	3.087	2.317
1963.....	11,672	64,791	8,442	16,790	40,427	121,365	238,000	3,479	3.002	2.408
1964.....	11,720	66,381	8,668	16,988	42,263	136,194	256,158	3,111	3.223	2.488
1965.....	11,551	67,091	8,545	16,734	42,665	136,530	252,098	3,749	3.200	2.550
1966.....	11,950	73,551	8,742	17,679	45,093	150,095	279,488	4,765	3.329	2.551
1967.....	¹ 12,408	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 307,400	N.A.	N.A.	N.A.
1968.....	¹ 13,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 338,100	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3581.

Table 4.—Number of Employees by Size of Establishment
Automatic Vending Machines—SIC 3581

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments
1958.....	121	7,894	\$142	68	598	\$10	32	1,461	\$22	21	5,835	\$110
1963.....	158	11,672	\$238	90	581	\$11	44	2,282	\$36	24	8,809	\$191

Source: Bureau of the Census.

Table 5.—Key Ratios
Automatic Vending Machines—SIC 3581

Item	1963
Investment per production worker.....	\$8,440
Specialization ratio (%).....	81
Concentration ratios (%):	
4 firms.....	55
8 firms.....	72
20 firms.....	84
50 firms.....	95

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Automatic Vending Machines—SIC 3581

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	11,672	South.....	1,333
Northeast.....	3,492	Florida.....	
New York.....	657	Texas.....	129
Pennsylvania.....	445	Mountain.....	15
East North Central.....	3,146	Colorado.....	4
Illinois.....	1,665	Pacific.....	762
West North Central.....	2,924	California.....	762
Minnesota.....	199		
Missouri.....	2,442		

Source: Bureau of the Census.

Table 7.—Principal Products
Automatic Vending Machines—SIC 3581

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Automatic vending machines, N.S.K.....	N.A.	*5	*1	Z	*4	9	11	11	*9	N.C.
Automatic vending machines and parts, and coin operated mechanisms.....	N.A.	153	184	195	219	197	219	229	255	N.A.

N.C. = Not computed.

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Blast Furnaces and Steel Mills

SIC 3312

The steel industry experienced moderate growth since 1958 with most of it occurring since 1962. Value of shipments increased 68 percent, or an average annual rate of 5.4 percent between 1958 and 1968. Since 1958, the industry's capital expenditures have doubled; advances in productivity have held the gain in steel employment to 8 percent. The table below presents salient data for 1960 and 1968 on a physical volume basis:

[Millions Net Tons]

	1960	1968 (esti- mated)	Annual rate of increase (decrease)
Raw steel production.....	99.3	130.0	3.4
Industry net shipments.....	71.1	92.0	3.3
Imports.....	3.4	15.5	21.0
Exports.....	3.0	1.5	(8.2)
Apparent consumption.....	71.5	106.0	4.4

Imported steel made significant inroads into the domestic market and rose from 2.9 percent of the market to an estimated 14.6 percent in 1968. As a result, domestic steel mills gained 65 percent of the 34.5 million-ton growth in steel consumption and lost the remainder, about 12 million tons, to imported steel.

GROWTH FACTORS

Steel's basic importance as an industrial material will guarantee continued growth of steel consumption. Steel, according to a recent congressional staff report, accounts by weight for about 95 percent of all metals used and for a substantial part of all processed basic materials used in manufacturing. Steel accounts for more than 5 percent of the value of inputs in 20 of the

major steel-using manufacturing industries. The demand for steel is thus directly influenced by the general level of economic activity and more specifically by the demand for durable goods. The automotive and construction industries are the largest consumers of steel followed by the machine building, container, railroad equipment, and appliance industries.

In the last decade steel technology has undergone a virtual revolution. In order to meet the demand for improved steel products and to enhance its competitive posture with respect to substitute materials and imported steel, the industry's expenditures for new plant and equipment have been at record levels.

The increasing use of the basic oxygen furnace (BOF) is an outstanding example of the new technology. The highly efficient BOF can produce in 1 hour or less, a heat of steel that required 6 to 12 hours in conventional open hearth furnaces. By 1970, 70 million tons of BOF steel capacity will be available. In contrast, BOF production was only 3.3 million tons as recently as 1960. The continuous casting process, in which steel is poured directly into a bloom, billet or slab ready for rolling, thus eliminating several initial processing steps, is expected to grow dramatically.

These advances and others, such as advances in raw material handling and processing, improved blast furnace technology, and increased use of computers to monitor all processing stages, will result in vastly improved efficiency. Parallel improvements in the steel production process is the continuing development of new and even more refined finished products to satisfy the demands of advancing technology in the

steel-using industries. Increased production of steel with high strength-to-weight ratios finds ready use in modern skyscrapers. The development of double reduced tinplate allows canmakers to save about 35 percent of the weight of conventional tinplate. The demand for steel in space and nuclear-age applications with exacting standards for chemical and physical properties has resulted in the development of many new types and a substantial gain in the production of alloy and stainless steels. As these trends continue the industry should be in excellent shape to meet the future market demands.

FUTURE PROSPECTS

In view of an expected trillion dollar economy in 1975 and the large increase in spending for both producer and consumer durable goods, the outlook for the steel industry is bright, competition from aluminum, plastics, and imported steel notwithstanding. By 1975 the population will already have increased by 14 to 18 million and the number of households will have risen by about 8 million. Steel consumption can be expected to rise accordingly, as the myriad demands of an increased population with larger average incomes are met.

**Table 1.—General Statistics
Blast Furnaces and Steel Mills—SIC 3312**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958	511,392	3,183,483	417,216	765,941	2,415,959	6,062,227	13,422,585	959,033	2.509	3.154
1959	507,540	3,448,374	419,385	776,515	2,636,672	6,823,398	15,628,664	669,266	2.588	3.396
1960	549,956	3,629,384	449,616	831,797	2,777,234	6,844,374	15,738,776	1,190,707	2.464	3.339
1961	503,417	3,523,170	409,098	767,626	2,670,185	6,546,304	14,873,318	805,462	2.452	3.478
1962	502,202	3,612,064	406,627	764,643	2,753,197	6,620,897	15,571,583	707,767	2.405	3.601
1963	500,550	3,711,639	412,311	791,364	2,892,006	7,506,433	16,417,981	908,440	2.596	3.654
1964	532,860	4,117,920	443,876	880,913	3,249,702	8,479,602	18,840,101	1,282,861	2.609	3.689
1965	565,366	4,431,643	464,509	912,938	3,498,524	9,379,782	20,841,660	1,363,982	2.681	3.832
1966	559,396	4,540,660	460,367	904,859	3,554,086	9,643,650	21,193,296	1,595,895	2.713	3.928
1967	¹ 539,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 19,985,300	N.A.	N.A.	N.A.
1968	¹ 554,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 22,500,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Blast Furnaces and Steel Mills—SIC 3312**

[1,000 net tons]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958	2,823	1,707	59,914	4.7	2.8
1959	1,677	4,396	69,377	2.4	6.0
1960	2,977	3,359	71,149	4.2	4.5
1961	1,990	3,163	66,126	3.0	4.6
1962	2,013	4,100	70,552	2.9	5.5
1963	2,224	5,446	75,555	2.9	6.7
1964	3,442	6,440	84,945	4.1	7.0
1965	2,496	10,383	92,666	2.7	10.1
1966	1,724	10,753	89,995	1.9	10.7
1967	1,685	11,455	² 83,897	² 2.0	² 12.0
1968	³ 743	³ 8,159	³ 52,566	³ 1.4	³ 13.4

¹ New supply consists of shipments plus imports.

² Estimated.

³ First 6 months.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Blast Furnaces and Steel Mills—SIC 3312**

United States buys from—

United States sells to—

ECSC
Japan
United Kingdom
Canada

Pakistan
Canada
ECSC
Argentina
United Kingdom

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Blast Furnaces and Steel Mills—SIC 3312**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	291	511,392	(1)	31	194	(1)	30	1,564	(1)	230	509,634	(1)
1963.....	288	500,550	\$16,611	41	236	(1)	26	983	(1)	221	499,331	(1)

¹ Value shipments omitted because of extensive duplication.

Source: Bureau of the Census.

**Table 5.—Key Ratios
Blast Furnaces and Steel Mills—SIC 3312**

Item	1958	1963
Investment per production worker.....	¹ \$22,515	\$40,271
Specialization ratio (%).....		
Concentration ratios (%):		
4 firms.....	53	50
8 firms.....	70	69
20 firms.....	84	89
50 firms.....	96	97

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Blast Furnaces and Steel Mills—SIC 3312**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	500,550	North Central—Continued	
New England.....	2,719	Michigan.....	21,288
Middle Atlantic.....	180,445	Ohio.....	79,558
New York.....	27,417	South.....	82,010
New Jersey.....	2,752	Virginia.....	644
Pennsylvania.....	150,276	Kentucky.....	6,415
North Central.....	206,932	Tennessee.....	1,367
Indiana.....	57,010	West.....	28,444
Illinois.....	41,569	California.....	15,834

Source: Bureau of the Census.

**Table 7.—Principal Products
Blast Furnaces and Steel Mills—SIC 3312**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Steel ingot and semifinished shapes.....	1,847	2,154	2,009	1,978	2,017	2,035	2,541	2,716	2,808	1.52
Hot rolled sheet and strip, including tin-mill products.....	3,169	3,154	3,638	3,543	3,737	3,970	4,495	4,755	4,667	1.47
Hot rolled bars and bar shapes, plates, structural shapes and piling.....	2,880	3,213	3,393	3,153	3,359	3,668	4,214	4,871	4,937	1.71
Other steel mill products, including wire products.....	199	214	214	162	176	226	246	291	367	N.C.
Blast furnace and electrometallurgical products excluding ferrochrome and ferrosilicon (including 33121 and 3313A).....	N.A.	1,511	1,486	1,386	1,356	1,731	1,529	1,583	1,607	N.A.
Steel wire.....	565	667	593	575	601	622	662	722	732	1.30
Steel pipe and tube.....	1,724	2,092	1,774	1,820	1,824	1,887	2,142	2,428	2,634	1.53
Cold-rolled steel sheet and strip.....	2,092	2,587	2,775	2,432	2,664	2,873	3,152	3,437	3,383	1.62
Cold-finished steel bars and bar shapes.....	339	468	448	407	466	473	532	643	700	2.06
Press and hammer steel forgings.....	235	N.A.	N.A.	N.A.	N.A.	294	352	377	410	1.75

N.A.=Not available.
N.C.=Not computed.

Source: Bureau of the Census.

Boatbuilding and Repairing

SIC 3732

Sparked by a buying boom after World War II the boatbuilding industry produced record numbers of pleasure craft. With sustained prosperity and rising personal income, the industry has continued to grow.

The industry is characterized by numerous small-size plants with nearly 60 percent of employees working in plants employing fewer than 100. The industry increased employment during 1958-68 by 26 percent. During this period, both the value of shipments and retail spending on boating, allowing for reverses in the early sixties, advanced by 63 percent.

GROWTH FACTORS

This luxury industry no longer relies on wealthy customers. Growing leisure time and higher incomes have widened its market by attracting buyers from all occupational levels. One industry survey shows that more than half the outboard motorboats sold in 1967 were purchased by blue collar workers.

Industry sources have reported successive rises in total spending for pleasure boating over the past 5 years, and 1968 estimates show another record in the making. Expenditure estimates include new and used boats, engines, accessories, safety equipment, fuel, insurance, docking maintenance, storage, repairs, and boat club memberships.

This imposing record has been produced by the singular rise in disposable personal income, which has not only spurred sales, but has also stimulated trading up—increased buying of bigger and more expensive equipment.

Recreational boats in use by 1967, according to industry estimates, numbered about 8.3 million, a rise since 1961 of more than 15 percent. This industry census comprises 591,000 inboard motorboats (including auxiliary-powered sailboats); 4,843,000 outboard motor boats; 561,000 sailboats (without power); and 2,280,000 rowboats, canoes, dinghies, prams, and other miscellaneous craft (many of which are used with outboard motors).

Fiberglass has been used extensively to manufacture boat hulls in recent years. Although fiberglass boats are generally more expensive than wooden boats of comparable size, they are competing successfully with wooden boats on the basis of their durability and ease of maintenance.

The trend toward a second home on ocean beaches and lakefronts encourages boat purchases. Other aids to the boating market include the growing adult population and the increase in recreational facilities through land and water conservation efforts of the State and Federal Governments and private industry.

With the exception of the sales slump in the early 1960's, most of the industry's growth has been achieved at an even pace. Causes for the temporary slump include a mild national economic recession and internal industry problems—too many boatbuilders, general lack of marketing sophistication, and a lot of small marginal operations short on cash and experience.

Price increases on boats were caused by rising costs of production and quality improvement. The average outboard motorboat, for example, has become larger and better equipped and the average value per unit has accordingly been higher.

FUTURE PROSPECTS

Increases in disposable personal income and leisure time, and the popularity of water sports are the factors that will generate sizable increases in sales of boats and marine engines. The replacement market will continue to be strong as owners trade their boats for larger, more expensive models. Engine replacement will be another important part of the industry's growth, both replacing worn out engines and trading up to higher horsepower.

Improved service facilities and an increased number of boat dealerships are expected to expand pleasure craft and accessory sales. Currently, many would-be owners are discouraged from purchasing boats because service facilities are not conveniently located. Construction of docking and launching facilities, presently being undertaken by private developers and the Federal Government, will stimulate further sales in the boatbuilding industry.

**Table 1.—General Statistics
Boatbuilding and Repairing—SIC 3732**

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	25,295	103,603	21,156	40,346	81,356	157,309	329,009	15,298	1.934	2.016
1959.....	29,056	121,538	24,862	49,875	96,537	176,409	389,381	N.A.	1.827	1.936
1960.....	26,048	110,070	21,991	42,914	85,037	154,413	360,670	N.A.	1.816	1.982
1961.....	22,671	100,641	18,717	39,980	77,485	138,146	316,608	N.A.	1.783	1.938
1962.....	22,659	104,328	18,804	39,993	80,707	148,051	314,400	N.A.	1.834	2.018
1963.....	24,861	116,140	20,867	42,011	91,443	183,059	360,208	13,472	2.002	2.177
1964.....	26,574	126,590	22,469	46,369	99,182	217,927	423,128	N.A.	2.197	2.139
1965.....	28,865	136,629	24,594	49,462	109,118	220,795	448,834	12,708	2.023	2.206
1966.....	30,825	145,737	25,161	49,239	111,813	247,427	485,121	N.A.	2.213	2.271
1967.....	¹ 32,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 505,000	N.A.	N.A.	N.A.
1968.....	¹ 32,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 535,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census.

Tables 2 and 3 are not relevant to SIC 3732

**Table 4.—Number of Employees by Size of Establishment
Boatbuilding and Repairing—SIC 3732**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments
1958.....	1,651	25,110	\$329	1,374	5,984	\$72	230	9,347	\$119	47	9,779	\$138
1963.....	1,626	24,861	360	1,358	5,695	73	222	9,193	127	46	9,973	161

Source: Bureau of the Census.

**Table 5.—Key Ratios
Boatbuilding and Repairing—SIC 3732**

Item	1958	1963
Investment per production worker.....	¹ \$4,037	\$5,504
Specialization ratio (%).....	94	97
Concentration ratios (%):		
4 firms.....	18	21
8 firms.....	25	29
20 firms.....	37	42
50 firms.....	52	56

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Boatbuilding and Repairing—SIC 3732**

Geographic area	All employees	Geographic area —(Continued)	All employees
Total.....	24,861	South Atlantic.....	6,130
New England.....	2,497	Maryland.....	2,097
Maine.....	494	Virginia.....	548
Rhode Island.....	434	North Carolina.....	563
Connecticut.....	290	South Carolina.....	122
Middle Atlantic.....	3,790	Florida.....	2,517
New York.....	1,759	East South Central.....	1,047
New Jersey.....	1,247	West South Central.....	2,609
Pennsylvania.....	784	Arkansas.....	472
East North Central.....	4,636	Louisiana.....	849
Michigan.....	1,894	Mountain.....	111
Wisconsin.....	824	Pacific.....	3,012
Ohio.....	504	Washington.....	891
West North Central.....	1,029	Oregon.....	138
Minnesota.....	750	California.....	1,874

Source: Bureau of the Census.

Table 7.—Principal Products
Boatbuilding and Repairing—SIC 3732

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Inboard Motorboats.....	76	87	100	87	92	126	*152	177	208	2.74
Outboard Motorboats.....	108	135	129	103	91	80	90	82	88	.81
All other boats.....	15	N. A.	N. A.	N. A.	N. A.	37	54	59	70	4.53
Boat repair.....	55	51	46	49	53	43	43	52	59	1.07
Boatbuilding and repairing, N.S.K.....	45	N. A.	N. A.	N. A.	N. A.	53	57	*51	*47	N. C.

N. A. = Not available.

N. C. = Not computed.

N.S.K. = Not specified by kind.

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Book Publishing and Printing

SIC 2731-2

The value of shipments for book publishing and its allied industry, book printing, more than doubled between the years 1958-68. Combined employment for the two industries numbers 100,000. New York, Boston, and Chicago are the principal areas for book publishing and printing. Philadelphia also remains a traditional publishing center.

Approximately 1,000 firms are engaged in book publishing. The ranks of book publishers include those firms which follow through from the idea of a book to the physical printing and distribution of the end product. Most book publishers, however, do not maintain their own typesetting, printing or binding facilities, and thus rely heavily on specialized book printers for physical production of books. The 600 book printers in the United States not only supply the printed book, but may also handle warehousing and distribution functions for their customers, the book publishers.

GROWTH FACTORS

Educational needs and demands of a rapidly growing population are an important element in the growth of these industries. At the same time, the accelerating increase in information for business, educational, social and cultural needs has stimulated broad thinking and experimentation in harnessing new technology to bring the "information explosion" to its potential users at reasonable costs. Capital expenditures to keep abreast of demand have tripled and quadrupled in 10 years. Prospects for even faster expansion are heralded by developing types of machinery and equipment.

Excluding the substantial contributions of Federal aid to education at all levels, expanding

school enrollments, more costly books (due to the increased use of color, overlays, the complexity of subject matter) and more books per student (greater use of teaching aids and supplementary materials, including paperback books) point to annual textbook sales growth of 6-7 percent in elementary schools, 8-9 percent in high schools and 11-13 percent in colleges. This growth is buttressed by the longer periods of formal schooling which are becoming commonplace, the growth in adult education, and expanded out-of-school training programs sponsored by business as well as by government and social groups. These extensions of the educational process have given rise to demand for books of all kinds, spurring growth both in bookstore sales and in specialized and general book clubs.

U.S. foreign trade in printed matter is dominated by books. Over a period of years, the export-import ratio has remained close to two-to-one. The developing countries of the world are particularly good markets and may improve as publishers' interest and attention swing toward these potential profit centers, provided current international copyright difficulties are adjusted. U.S. international aid has greatly assisted exports to some regions. The export market may be reduced, however, by the establishment of U.S. plants or joint ventures in countries where sales are growing rapidly.

FUTURE PROSPECTS

Currently, the printed page is the least costly means of furnishing, storing and retrieving information. Yet developments in electronics, optics and other branches of physics as well as chemistry seem to point to the computer as a universal

information processing machine which will bring individual media, such as printed materials, television and radio, into an integrated communications complex. Linked with new typesetting and printing press machinery, the computer is already altering traditional craft methods of the industry.

Capital expenditures in the industry exhibit an interesting dichotomy. On the one hand, printers and publishers are investing in automation of existing equipment, faster equipment, and installation of web-offset presses—reflecting book printers' belief that the cost effectiveness of the book for the foreseeable future is unassailable. At the same

time, changes in communication technology involving lasers, microwave generators, communication satellites and invention of a host of components designed to fit these into the everyday needs of the student, businessman and consumer, presage eventual upset of this growing, yet traditional industry.

The printed format will not disappear, but the way in which it is produced and distributed may alter radically, offering exceptional opportunities to innovators willing to take the financial risks of leadership on advancing technological frontiers.

**Table 1.—General Statistics
Books, Publishing and Printing—SIC 2731**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	38,502	191,859	11,023	21,088	44,463	616,241	1,033,144	13,090	13.860	2.108
1959.....	39,911	211,248	11,800	24,641	53,832	721,163	1,148,733	10,064	13.397	2.185
1960.....	42,422	233,347	12,534	27,591	57,604	834,142	1,303,291	16,988	14.481	2.088
1961.....	43,865	248,999	11,803	27,748	58,716	882,365	1,382,291	16,055	15.028	2.116
1962.....	47,015	277,424	12,069	28,003	61,945	953,859	1,527,841	N.A.	15.398	2.212
1963.....	46,812	280,664	11,810	23,450	59,474	995,736	1,534,632	25,426	16.742	2.536
1964.....	53,076	330,920	14,519	27,574	71,919	1,099,780	1,728,589	28,715	15.292	2.608
1965.....	50,372	322,474	11,456	22,682	55,941	1,115,113	1,767,114	29,616	19.934	2.466
1966.....	54,023	359,789	12,212	23,615	60,984	1,325,666	1,996,324	47,917	21.738	2.582
1967.....	¹ 58,000	¹ 387,000	N.A.	N.A.	N.A.	N.A.	¹ 2,170,000	N.A.	N.A.	N.A.
1968.....	¹ 58,000	¹ 415,000	N.A.	N.A.	N.A.	N.A.	¹ 2,360,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Books, Publishing and Printing—SIC 2731-32**

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$39.0	\$15.6	\$1,011	3.9	1.5
1959.....	44.7	18.2	1,134	3.9	1.6
1960.....	51.2	21.6	1,282	4.0	1.7
1961.....	57.0	25.0	1,365	4.2	1.8
1962.....	65.0	33.4	1,502	4.3	2.2
1963.....	77.6	39.9	1,549	5.0	2.5
1964.....	88.5	43.0	1,730	5.1	2.4
1965.....	99.3	46.9	1,818	5.5	2.5
1966.....	120.8	59.7	2,031	5.8	2.8
1967.....	143.2	69.2	² 2,200	² 6.5	² 3.0
1968.....	² 155.0	² 66.5	² 2,400	² 6.5	² 2.7

¹ New supply consists of shipments plus imports.

² Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Books, Publishing and Printing—SIC 2731-32**

United States buys from—	United States sells to—
United Kingdom	Canada
Netherlands	United Kingdom
West Germany	Japan
Italy	Australia
Japan	Italy
Switzerland	Netherlands
Canada	Brazil
France	Republic of South Africa
Mexico	Mexico
Spain	Republic of the Philippines

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Books, Publishing and Printing—SIC 2731

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments
1958.....	903	40,069	\$1,033	670	3,266	\$90	151	7,108	\$274	82	29,695	\$670
1963.....	993	46,812	1,535	737	3,333	116	165	7,157	254	91	36,322	1,165

Source: Bureau of the Census.

Table 5.—Key Ratios
Books, Publishing and Printing—SIC 2731

Item	1958	1963
Investment per production worker.....	¹ \$16,013	\$21,497
Specialization ratio (%).....	92	93
Concentration ratios (%):		
4 firms.....	16	20
8 firms.....	29	33
20 firms.....	48	56
50 firms.....	69	76

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Books, Publishing and Printing—SIC 2731

Geographic area	All em-ployees	Geographic area	All em-ployees
Total.....	46,812	South Atlantic.....	1,048
New England.....	2,133	Maryland.....	139
Massachusetts.....	1,892	District of Columbia.....	438
Middle Atlantic.....	24,665	East South Central.....	796
New York.....	19,189	West South Central.....	482
New Jersey.....	4,036	Texas.....	326
Pennsylvania.....	1,440	Mountain.....	129
East North Central.....	12,765	Pacific.....	1,703
Indiana.....	1,075	California.....	1,587
Illinois.....	7,073		
Ohio.....	1,834		
West North Central.....	3,091		
Minnesota.....	2,003		
Missouri.....	938		

Source: Bureau of the Census.

Table 7.—Principal Products
Books, Publishing and Printing—SIC 2731

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Textbooks.....	282	311	360	389	415	471	525	640	779	2.77
Subscription reference books.....	164	177	200	197	221	207	190	211	195	1.19
Technical, scientific and professional books.....	116	125	135	144	145	156	183	176	193	1.67
Religious books.....	59	61	64	73	73	81	84	77	86	1.47
General books (trade), etc.....	275	312	348	386	448	460	538	531	611	2.23
Other books and pamphlets.....	96	112	131	128	152	155	184	181	213	2.22
Book, publishing and printing, N.S.K.....	20	*36	*46	*49	*48	19	*25	3	*4	N.C.

*Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Table 1.—General Statistics
Book Printing—SIC 2732

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	28,625	143,990	23,732	46,758	112,312	226,793	357,652	10,846	2.019	2.402
1959.....	29,322	160,399	24,631	49,901	125,475	260,171	394,980	N.A.	2.073	2.514
1960.....	31,418	173,283	26,562	53,673	135,531	297,759	462,921	16,614	2.197	2.525
1961.....	33,002	189,173	27,925	57,455	148,202	322,721	483,779	N.A.	2.178	2.579
1962.....	34,154	197,803	28,733	57,728	153,652	318,224	478,786	N.A.	2.071	2.662
1963.....	36,101	214,175	29,641	59,563	164,559	358,294	546,587	24,945	2.177	2.763
1964.....	35,690	226,878	29,165	62,437	178,757	385,165	585,462	31,817	2.155	2.803
1965.....	38,732	255,478	32,020	67,565	198,610	411,206	632,709	38,167	2.070	2.940
1966.....	41,103	284,293	34,410	72,745	221,925	460,800	709,346	42,058	2.076	3.051
1967.....	¹ 43,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 772,400	N.A.	N.A.	N.A.
1968.....	¹ 44,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 841,100	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA

Foreign trade data for SIC 2732 included in tables 2 and 3 for SIC 2731.

Table 4.—Number of Employees by Size of Establishment
Book Printing—SIC 2732

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments
1958.....	791	28,625	\$358	586	2,777	\$42	148	5,907	\$78	57	19,941	\$237
1963.....	683	36,101	547	408	2,739	48	210	8,413	150	65	24,949	349

Source: Bureau of the Census.

Table 5.—Key Ratios
Book Printing—SIC 2732

Item	1958	1963
Investment per production worker.....	¹ \$4,640	\$8,404
Specialization ratio (%).....	72	78
Concentration ratios (%):		
4 firms.....	24	19
8 firms.....	34	30
20 firms.....	51	48
50 firms.....	68	66

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Book Printing—SIC 2732

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	36,101	South Atlantic.....	3,438
New England.....	6,089	Maryland.....	961
Massachusetts.....	4,643	District of Columbia.....	635
Connecticut.....	254	North Carolina.....	356
Middle Atlantic.....	10,507	South Carolina.....	226
New York.....	6,786	Florida.....	331
New Jersey.....	1,298	East South Central.....	1,954
Pennsylvania.....	2,423	West South Central.....	1,265
East North Central.....	8,943	Texas.....	932
Indiana.....	3,881	Mountain.....	647
Illinois.....	1,911	Pacific.....	1,017
Ohio.....	2,034	California.....	897
West North Central.....	2,241		
Minnesota.....	214		
Missouri.....	1,224		

Table 7.—Principal Products
Book Printing—SIC 2732

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Book and pamphlet printing and book binding (lithographic process).....	168	209	253	255	256	344	356	416	484	2.89
Book and pamphlet printing and book binding (other process).....	248	259	263	263	271	242	259	286	325	1.31
Book printing, N.S.K.....	7	*5	*15	*22	13	21	22	*21	*18	N.C.

*Standard error of estimate of 15 percent or more.
N.C.=Not computed.
N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Cathode Ray Picture Tubes

SIC 3672

As a provider of an essential component for household television receivers, the cathode ray picture tube manufacturing industry over the past decade has blossomed under boom conditions. Value of shipments rose some 455 percent between 1958 and 1968 to \$890 million. During the same period employment rose 155 percent to 22,800.

GROWTH FACTORS

The major influence in the rapid growth of cathode ray picture tube shipments has been the expanding demand for monochrome and color television sets for home use.

Impetus for cathode ray picture tube growth in the early 1960's was provided by the rising demand for monochrome sets. Many families became two- and three-set households. New options were offered—wider screens, portables, remote control devices, UHF programing, and VHF-UHF receivers. Declining prices of monochrome sets and tubes reflected increased productive efficiency and a steadily increasing competitive environment in the U.S. industry.

By 1965 a new growth impetus—consumer color television receivers—was gaining momentum. Consumers now have the option of moving up to color with a new or replacement set. Sales of color television sets reached an annual rate of nearly 5 million in 1966 and 5.5 million in 1967. This led to a decline in monochrome set production of 29 percent or 5.1 million in 1967, the first year in which more color than monochrome sets were produced.

As of 1968, manufacturing capacity of the industry has been expanded by unprecedented capital expenditures to handle anticipated growth in color tube demand over the next few years. Expenditures for new plant and equipment are expected to level off in the immediate future.

Foreign competition, which comes primarily from Japan, has been rising as domestic producers face increased costs of development and production. Demand for U.S. tubes abroad is to a large degree precluded by established supplying countries, specifically the Netherlands in Europe and Japan in the Orient.

FUTURE PROSPECTS

Continued growth in shipments of color tubes is foreseen over the next few years with more moderate growth expected for monochrome tubes. Pressure from imports depends on comparative developments in cost factors between competing producing countries and on the success of product innovations or specialization such as Japan's concentration on the compact portable television set market in the United States.

Another uncertainty is the effect of technological breakthroughs which might replace conventional cathode ray picture tubes.

A source of accelerating demand for cathode ray picture tubes is foreseen in nonconsumer uses. Closed-circuit television and information displays are gaining wide acceptance in industry, education, and business. New applications for the home may not be far into the future.

Table 1.—General Statistics
Cathode Ray Picture Tubes—SIC 3672

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	8,554	38,092	6,955	14,183	27,570	67,472	159,252	1,794	2.447	1.944
1959.....	7,649	40,314	6,135	12,841	28,845	82,493	183,169	N.A.	2.860	2.246
1960.....	8,019	43,015	6,597	13,350	30,999	77,056	179,932	3,125	2.486	2.322
1961.....	7,498	41,059	6,094	12,475	28,671	84,073	183,505	N.A.	2.932	2.298
1962.....	6,809	40,212	5,425	11,158	27,485	63,406	167,947	3,666	2.307	2.463
1963.....	10,916	66,888	7,958	16,634	40,468	128,354	269,122	16,138	3.172	2.433
1964.....	11,276	73,705	8,056	17,963	43,907	161,984	308,921	18,786	3.689	2.444
1965.....	14,296	96,727	10,771	23,780	61,747	273,565	458,670	42,202	4.430	2.597
1966.....	24,737	156,786	19,583	42,708	111,126	472,502	812,433	72,452	4.252	2.602
1967 ¹	26,100	N.A.	N.A.	N.A.	N.A.	N.A.	823,103	N.A.	N.A.	N.A.
1968 ¹	22,800	N.A.	N.A.	N.A.	N.A.	N.A.	890,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Cathode Ray Picture Tubes—SIC 3672

[Dollars in millions]

Year	Exports	Imports	Shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$14.7	N.A.	\$177	8.3	N.A.
1959.....	13.8	N.A.	212	6.5	N.A.
1960.....	21.3	N.A.	213	10.0	N.A.
1961.....	21.3	N.A.	229	9.3	N.A.
1962.....	16.2	N.A.	222	7.3	N.A.
1963.....	10.1	N.A.	249	4.1	N.A.
1964.....	11.2	\$ 8	291	3.8	0.3
1965.....	9.8	1.6	432	2.3	.4
1966.....	16.0	6.9	812	1.9	.8
1967.....	19.3	13.5	² 823	² 2.2	² 1.6
1968.....	² 22.3	² 20.4	² 890	² 2.4	² 2.2

¹ New supply consists of shipments plus imports.

² Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Cathode Ray Picture Tubes—SIC 3672

United States buys from—

United States sells to—

Netherlands
Japan

Canada
Mexico

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Cathode Ray Picture Tubes—SIC 3672

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	75	8,554	\$159	45	362	\$3	21	(1)	(1)	9	8,192	\$156
1963.....	151	10,916	269	123	580	7	20	788	\$13	8	9,548	250

¹ Not available, included in 100 and over.

Source: Bureau of the Census.

Table 5.—Key Ratios
Cathode Ray Picture Tubes—SIC 3672

Item	1963
Investment per production worker.....	\$12,559
Specialization ratio (%).....	85-90
Concentration ratios (%):	
4 firms.....	91
8 firms.....	95
20 firms.....	97
50 firms.....	99

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Cathode Ray Picture Tubes—SIC 3672

Geographic area		All employees	
Total.....	10,916	East North Central.....	5,388
		West North Central.....	37
Northeast.....	4,973	South and West.....	518

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3672.

Commercial Printing, Lithographic

SIC 2752

The lithographic printing industry has achieved tremendous growth in the last decade, both in terms of value of shipments and total employment. A 175 percent increase in value of shipments from 1957 to 1968 to an estimated \$3 billion has made lithographic printing one of the Nation's 50 largest industries in terms of output. Also, the 87 percent increase in employment during this period has put the industry among the top 25 industries in terms of number employed.

Lithographic printing, like all of commercial printing, is concentrated in the major urban centers of population. Some 42 percent of all the establishments classified in lithographic printing in 1963 were located in four States—New York, California, Illinois, and Pennsylvania; most of these establishments were located in New York, Los Angeles, Chicago, and Philadelphia. These establishments accounted for 45 percent of the industry's total value of shipments and 27 percent of its total employment in 1963.

GROWTH FACTORS

The growth of lithographic printing can be attributed, first of all, to those factors which have stimulated all of commercial printing. One such factor has been the rising expenditures for printed advertising (excluding newspaper advertising) which increased 33 percent between 1960 and 1966. Growth in direct mail advertising has also helped in boosting printed advertising.

The information explosion coupled with our growing population has resulted in an increase (dramatic, in the case of lithography) in all commercial printing products, especially magazines and periodicals, books of all kinds, and catalogs and directories.

Lithography, though discovered in 1796, gained significant acceptance by commercial printers only during the past 50 years, with increasing acceptance in the past 10 years with the development of the web-fed (roll) presses. Some of the factors which made the lithographic process more attractive than the letterpress are: lower preparation costs, lower cost press plates, quicker "make ready," and a wider possible choice of papers.

These advantages, coupled with the demand for more color in all printing, resulted in lithography attaining an ever-increasing share of the commercial printing market. It increased its share of total commercial printing value of shipments from 30 percent in 1957 to an estimated 52 percent in 1968.

The rapid development of photographic typesetting, which lends itself well to the lithographic process, has increased the acceptance of this process by the printer. The production of type set on film enables direct platemaking to be accomplished in fewer operations.

The increasing use of typewriter-like devices, providing a wide range of type faces and margin justification to produce camera copy by direct impression, has also contributed to the growth of lithography.

FUTURE PROSPECTS

While letterpress still accounts for a substantial share of commercial printing shipments, and the gravure continues to grow, lithography's share of the market can be expected to increase at its current annual growth rate for the foreseeable future.

Technological improvements in typesetting, printing plates, automated electronic press controls, and in the presses themselves indicate that

this process will make further inroads into long run magazine and package printing.

Developments now under way, allowing for

variable print length or cutoffs, will open up new markets for web lithographic printing, now limited somewhat by fixed print lengths.

Table 1.—General Statistics
Commercial Printing, Lithographic—SIC 2752

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1957.....	83,445	449,690	63,758	126,518	306,393	753,456	1,207,662	39,343	2.46	2.42
1958.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1959.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1960.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1961.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1962.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1963.....	121,072	794,353	91,358	187,293	554,933	1,302,046	2,149,651	76,877	2.35	2.96
1964.....	121,064	816,487	91,351	190,516	568,181	1,335,291	2,243,262	99,275	2.35	2.98
1965.....	132,308	920,891	100,313	202,237	635,482	1,478,956	2,536,550	98,636	2.33	3.14
1966.....	141,053	1,011,172	107,125	214,042	698,253	1,631,869	2,791,438	112,168	2.34	3.26
1967.....	¹ 148,388	¹ 1,096,110	N.A.	N.A.	N.A.	N.A.	¹ 3,045,200	N.A.	N.A.	N.A.
1968.....	¹ 156,104	¹ 1,188,184	N.A.	N.A.	N.A.	N.A.	¹ 3,322,600	N.A.	N.A.	N.A.

¹ Estimated.

Source: Bureau of the Census and BDSA.

N.A.=Not available.

Tables 2 and 3 are not relevant to SIC 2752.

Table 4.—Number of Employees by Size of Establishment
Commercial Printing, Lithographic—SIC 2752

(Dollars in millions)

Year	Total			1-19			20-99			100 and over		
	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments
1958.....	3,746	89,678	\$1,342	2,720	16,957	\$260	848	34,029	\$505	178	38,692	\$577
1963.....	6,822	121,072	2,150	5,483	28,538	484	1,125	44,470	790	214	48,064	876

Source: Bureau of the Census.

Table 5.—Key Ratios
Commercial Printing, Lithographic—SIC 2752

Item	1963
Investment per production worker.....	N.A.
Specialization ratio (%).....	80
Concentration ratios (%):	
4 firms.....	6
8 firms.....	10
20 firms.....	16
50 firms.....	25

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Commercial Printing, Lithographic—SIC 2752

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	121,072	South Atlantic.....	9,191
New England.....	8,370	Delaware.....	396
Maine.....	168	Maryland.....	2,364
Massachusetts.....	5,323	District of Columbia.....	896
Connecticut.....	2,128	North Carolina.....	605
Middle Atlantic.....	31,755	Florida.....	1,646
New York.....	20,374	East South Central.....	3,575
New Jersey.....	3,823	Kentucky.....	815
Pennsylvania.....	7,558	Tennessee.....	2,149
East North Central.....	35,868	West South Central.....	5,208
Indiana.....	1,992	Arkansas.....	246
Illinois.....	14,433	Texas.....	3,502
Michigan.....	5,732	Mountain.....	2,546
Wisconsin.....	4,366	Montana.....	137
Ohio.....	9,345	New Mexico.....	161
West North Central.....	13,568	Pacific.....	10,991
Minnesota.....	7,212	California.....	8,667
Missouri.....	3,667	Hawaii.....	489
North Dakota.....	114		

Source: Bureau of the Census.

Table 7.—Principal Products
Commercial Printing, Lithographic—SIC 2752

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Magazines and periodicals.....	66	100	110	109	124	139	134	183	210	3.17
Labels and wrappers.....	123	129	141	126	126	147	163	173	188	1.52
Catalogs and directories.....	76	90	96	106	116	165	161	209	233	3.09
Financial and legal.....	50	70	77	80	80	109	108	111	122	2.43
Advertising (direct mail, display and other).....	577	625	659	693	727	722	815	845	919	1.59
Other general (job) lithography.....	372	319	341	397	425	518	515	664	747	2.01
Lithographic plates made for others.....	68	74	78	82	98	130	144	170	203	2.99
Printing, lithographic, N.S.K.....	33	*59	*65	*57	*58	96	*85	92	*80	N.C.

* Standard error of estimate of 15 percent or more.
N.C.=Not computed.

Source: Bureau of the Census.

Computing and Related Machines

SIC 3571

The rapid growth of the computing machine industry must be appreciated and understood within the context of what some observers now call "the information revolution." This revolution can be described as the increasing demand for efficient recordkeeping and rapid means of processing the mammoth volumes of information generated by the events of modern life. Sales and employment figures for the industry reflect the steadily increasing need for computing equipment. The value of annual industry shipments increased from about \$3 billion in 1964 to an estimated \$6.7 billion in 1968. Since 1958, employment within the industry has more than doubled, to about 160,000.

GROWTH FACTORS

Within an environment characterized by rapidly increasing demand, marketing has been a prime activator of growth in the computing machines industry. Since it is the point of contact with the customer, its functions include both making the sale and keeping the customer satisfied. Specialists analyze the customer's problems, derive a solution, and recommend hardware. Training in the use of the equipment is provided, and maintenance supplied. It follows that the more complex the equipment, the more necessary the support functions. Thus, the industry recognizes that its marketing effort is not only one of selling the product, but also of providing a continuing service to the customer.

The industry has progressed through profound and rapid changes in concepts, design and performance of its products. Within a period of 15 years, there has been a steady technological evolution from the "first generation" computers with vacuum tube circuitry and rather limited

storage and function capability to the "third generation" computer of today utilizing solid state integrated circuits. To a major degree, this technological advancement has been made possible by the initial leadership of the U.S. Government in utilizing computers and directing R. & D. efforts toward improvements in design and general function capacity of computer systems.

The technological advances generated by this Government support has had a tremendous impact upon the whole computer industry. The state of computer engineering and the degree of advancement seen in today's computers are far ahead of what they would have been without the impetus of Government efforts in research and development. These technological refinements mean that today's computers are more versatile and are capable of much lower cost per unit of computation. As a result, computer services can now be offered to a greater number of potential users than once thought possible.

But just as the industry has found technological innovation to be crucial to its growth, so have individual companies within the industry. Basic technology has been one of the main focal points of the vigorous competition that has characterized the industry. Computing cost, ease of use, and functional capacity are all vital factors which the manufacturer must take into consideration in adapting products to the needs of the market. Companies have thus undertaken intensive research and development efforts in attempts to gain and hold customers. It is estimated that companies within the industry spend an average amount on R. & D. equal to 8 percent of sales and rental revenue.

Because of the constant pressures of rapid technological advancement, some companies have

found profits to be illusory in competitively introducing and marketing computers. Other companies have, however, maintained a profitable footing by specializing in certain technologies germane to the computer field. They have been successful by correctly identifying specific areas within the industry which best coincide with their abilities and the needs of the market. These specialized approaches include efforts in software development ("software" is the term used to describe the detailed instructions used in computer hardware), memory bank research, and teleprocessing techniques (the use of telecommunications facilities in transmitting data input and outputs). Certain companies have focused their activities upon filling gaps in computer lines now being offered. For instance, a few manufacturers are developing very large computer systems capable of multiprocessing and serving a large number of uses in a wide variety of functions. These advances have permitted adaptation to specific industry and commercial activities which cover such diverse areas as corporate management, banking functions, retail customer service and process control functions in certain manufacturing processes.

Foreign trade in computer equipment is steadily increasing. The industrial and technological advances of other nations have generated a demand for all types of U.S.-manufactured computing machines overseas. Preference for the U.S. equipment in foreign markets is evidence of U.S. technological superiority and the aggressive marketing efforts of a well established, rapidly growing domestic industry. An increasing portion of foreign demand for those products is being met by the foreign-based subsidiaries of U.S. firms with an increasing percentage of parts for computing equipment comprising the actual export total.

A major portion of the imported computing machines are the conventional types (calculating and accounting machines) rather than electronic computers. Most of these imports are from U.S. foreign-based subsidiaries; with imports from Italy making up much of the remaining portion.

The computer industry is becoming a truly international industry with nearly all major U.S.

companies having subsidiaries in foreign countries. By locating plants in foreign countries, these firms can more easily take advantage of foreign markets for computers and the lower production costs outside the United States. The result of this foreign expansion has been that state of the technical arts has been greatly advanced in these foreign markets.

Several countries are attempting to establish their own computer industries through government subsidy and the application of technical expertise acquired through the exposure to American computer manufacturing efforts. Within the market for more sophisticated computer equipment, however, these companies are not expected to offer major competition for U.S. subsidiaries within the near future.

FUTURE PROSPECTS

Present trends indicate that the computer industry is becoming more service oriented in its approach to marketing and technological developments. Increased time sharing and the rapidly increasing number of service bureaus are developments which lead observers to believe that the industry will one day be a utility industry such as electric power or telecommunication. What is envisioned is a computer utility which will serve literally anyone demanding information through computer services. Central processing units with tremendous storage and function capabilities will be connected to hundreds or even thousands of peripheral input-output units. This type of system will require continued technological innovations and applications. A greater emphasis is now being put on research in software application and the development of peripheral units with much greater capacity. A system of teleprocessing will also play an integral role in establishing this type of information utility. The concept of teleprocessing involves the use of telephone, telegraph, or radio links in transmitting information between the central processing unit and the peripheral unit. Ultimately, the system would permit several users to share one computer system, each paying only for the time used plus transmission costs.

Table 1.—General Statistics
Computing and Related Machines—SIC 3571

Year	Total employment		Production workers			Value ¹ added (\$1,000)	Value ¹ shipments (\$1,000)	Capital ex- penditures (\$1,000)	Value ¹ added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	80,864	473,455	50,523	98,497	269,013	579,103	1,104,194	61,494	2.153	2.731
1959.....	78,154	488,028	50,147	98,406	275,080	722,538	1,301,719	38,958	2.627	2.795
1960.....	95,050	638,796	60,043	120,306	353,748	822,012	1,555,715	69,754	2.324	2.940
1961.....	98,261	677,751	60,720	120,280	366,431	915,619	1,676,748	93,147	2.499	3.046
1962.....	100,549	722,357	59,519	118,109	364,645	1,025,776	1,833,241	87,830	2.813	3.087
1963.....	96,370	703,231	58,985	119,521	369,459	1,101,484	2,019,714	92,628	2.981	3.091
1964.....	102,790	775,737	62,659	128,788	395,555	1,762,600	3,011,420	89,088	4.456	3.071
1965.....	115,050	907,527	68,682	141,575	458,571	2,146,637	3,352,538	144,420	4.681	3.239
1966.....	136,440	1,078,289	81,321	169,572	540,179	2,827,706	4,832,842	162,449	5.235	3.186
1967.....	² 145,500	N.A.	N.A.	N.A.	N.A.	N.A.	² 5,703,000	N.A.	N.A.	N.A.
1968.....	² 159,000	N.A.	N.A.	N.A.	N.A.	N.A.	² 6,730,000	N.A.	N.A.	N.A.

¹ Data for earlier years are not comparable to those for 1964, 1965, and 1966. Revised figures on a comparable basis for earlier years will be published by the Census Bureau at a later date.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Computing and Related Machines—SIC 3571

[Dollars in millions]

Year	Ex- ports	Im- ports	Product ship- ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	N.A.	N.A.	N.A.	N.A.	N.A.
1959.....	N.A.	N.A.	N.A.	N.A.	N.A.
1960.....	N.A.	N.A.	N.A.	N.A.	N.A.
1961.....	N.A.	N.A.	N.A.	N.A.	N.A.
1962.....	N.A.	N.A.	N.A.	N.A.	N.A.
1963.....	N.A.	N.A.	N.A.	N.A.	N.A.
1964.....	\$369	\$57	\$2,734	12.2	2.1
1965.....	415	79	2,964	12.4	2.6
1966.....	493	116	4,156	10.2	2.7
1967.....	640	155	4,790	² 13.3	² 3.1
1968.....	² 800	² 200	² 5,519	² 14.4	² 3.5

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

N.E.C.=Not elsewhere classified.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Computing and Related Machines—SIC 3571

United States buys from—	United States sells to—
Canada France United Kingdom West Germany Japan	Italy United Kingdom Canada France

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Computing and Related Machines—SIC 3571

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	136	80,864	\$1,104	65	364	\$5	23	1,136	\$15	48	79,364	1,085
1963.....	248	96,370	2,020	109	675	12	59	2,761	48	80	92,934	1,960

Source: Bureau of the Census.

Table 5.—Key Ratios
Computing and Related Machines—SIC 3571

Item	1958	1963
Investment per production worker.....	N.A.	\$13, 441
Specialization ratio (%).....	N.A.	93
Concentration ratios (%):		
4 firms.....	N.A.	67
8 firms.....	N.A.	80
20 firms.....	N.A.	92
50 firms.....	N.A.	98

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Computing and Related Machines—SIC 3571

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	96, 370	East North Central.....	26, 577
New England.....	3, 494	West North Central.....	11, 632
Massachusetts.....	3, 050	South.....	4, 006
Middle Atlantic.....	33, 814	Maryland.....	173
New York.....	26, 885	West.....	16, 847
New Jersey.....	2, 442		
Pennsylvania.....	4, 487		

Source: Bureau of the Census.

Table 7.—Principal Products
Computing and Related Machines—SIC 3571

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Electronic data processing machines excluding, typewriters, excluding parts and attachments.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1, 202	1, 991	N.A.
Computing and related machines N.S.K.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	7	*1	N.C.
Computing and accounting machines including cash registers parts and attachments for data process machines excluding typewriters.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1, 755	2, 164	N.A.

*Standard error of estimate of 15 percent. or more.

N.A.=Not available.

N.C.=Not computed.

Source: Bureau of the Census.

Construction Machinery

SIC 3531

The construction machinery industry underwent dynamic growth between 1958 and 1968. Value of shipments increased from \$2.1 billion in 1958 to an estimated \$4.0 billion in 1968, while employment increased only 13 percent. U.S. manufacturers and their foreign-based subsidiaries and affiliates account for 80 to 85 percent of Free World construction machinery production.

The domestic industry, which comprises more than 600 establishments, manufactures 190 separate products in hundreds of models and sizes. Establishments located in six Midwestern States account for 80 percent of the value of total output—Illinois alone accounts for 50 percent.

GROWTH FACTORS

The increase in domestic construction during the past decade has been the major factor leading to growth in the construction machinery industry. Domestic construction, which averages about 12 percent of Gross National Product, increased about 66 percent to an estimated \$83.5 billion during the 1958-68 period.

Shortages of skilled workers in the construction trades and rising wage demands have contributed to increased mechanization in all phases of the construction industry. New building materials and methods have led to greater mechanization of residential and non-residential building construction. Prefabricated sections and modular units, which must be lifted into place with cranes, are becoming increasingly important. Sophisticated heavy earth-moving equipment has greatly increased the efficiency and productivity of workers grading and preparing land for highways, housing developments, dams and other projects.

Weather also has contributed to the trend toward mechanization in the construction indus-

try. With climatic conditions in particular areas limiting the building season, builders have found that increased use of construction machinery can raise their productivity. They are also better able to meet construction deadlines and, thus, avoid paying penalty fees when contracts are not fulfilled by fixed completion dates.

Shortages of skilled machine operators have followed in the wake of mechanized construction. Demands have been placed on the machinery industry to increase the size and productive capacity of its products, and to develop machinery that reduces the number of operators needed to complete a project. Although improvements have raised the prices of many machines, the increased efficiency of the newer, larger equipment is looked upon as a positive attribute.

Military purchases of construction equipment have also spurred the industry's sales. Construction activity in Vietnam, especially since 1965, has been the most significant source of construction machinery sales to the military.

Construction machinery exports have contributed significantly to the industry's growth. Exports doubled between 1958 and 1964, and have since remained above the \$1 billion per year mark. While most exports are purchased by the industrialized nations of Western Europe and Canada, new markets are being created in the developing countries through the Agency for International Development and the International Development Association. Exports through the A.I.D. foreign assistance program alone amounted to \$71 million in 1967.

FUTURE PROSPECTS

Growth in the construction industry, and, thus, the construction machinery industry, will be the

result of increases in business activity, population, personal income and Federal, State and local Government spending. In the next decade, the Gross National Product will be approaching an estimated \$1.5 trillion, population will increase to 230 million, and about half of all families will have incomes of \$10,000 or more.

If Federal housing programs for lower income groups come to fruition in the next 10 years, the construction machinery should experience growth greater than that of the past 10 years. Growth in the demand for power cranes and hoists should be substantial, as prefabricated sec-

tions will be particularly important building materials to reduce the cost of building these residential units.

Federal and State funding for highways and other public works programs, such as dams, water and soil conservation projects, will also have a favorable impact on construction machinery and equipment.

Additions to highway systems will be essential to transporting the increased industrial output to market. Increases in personal income and leisure time will bring with them rising automobile ownership and a greater desire to travel.

**Table 1.—General Statistics
Construction Machinery—SIC 3531**

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	95,304	496,751	66,510	124,622	310,252	1,022,801	2,107,352	45,377	3.297	2.490
1959.....	112,809	654,886	81,240	166,059	435,200	1,179,894	2,517,379	66,108	2.711	2.621
1960.....	111,713	636,645	78,067	152,464	412,615	930,715	2,254,164	71,317	2.256	2.706
1961.....	94,954	570,135	67,169	131,360	366,198	972,120	2,150,450	41,384	2.655	2.788
1962.....	98,996	631,091	71,317	142,334	416,760	1,142,868	2,369,864	49,835	2.742	2.928
1963.....	104,520	683,728	76,526	155,267	462,411	1,301,266	2,696,039	56,227	2.814	2.978
1964.....	116,255	790,081	86,628	177,701	544,147	1,590,125	3,200,070	74,148	2.922	3.062
1965.....	121,464	850,030	90,763	185,959	590,744	1,744,955	3,545,551	105,513	2.954	3.177
1966.....	121,235	899,033	92,053	192,841	632,406	1,880,728	3,767,753	129,826	2.974	3.279
1967.....	¹ 121,100	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,500,000	N.A.	N.A.	N.A.
1968.....	¹ 121,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,980,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Construction Machinery—SIC 3531**

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$522	\$1	\$1,996	26.2	0.1
1959.....	603	2	2,375	25.4	.1
1960.....	659	3	2,052	32.1	.1
1961.....	701	3	1,990	35.2	.2
1962.....	713	6	2,159	33.0	.3
1963.....	832	6	2,624	31.7	.2
1964.....	1,027	29	3,023	34.0	1.0
1965.....	1,055	37	3,452	30.6	1.1
1966.....	1,073	50	3,829	28.0	1.3
1967.....	1,150	55	² 3,560	² 32.3	1.5
1968.....	² 1,200	² 60	² 4,048	² 29.9	1.4

¹ New supply consists of shipments plus imports.

² Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Construction Machinery—SIC 3531**

U.S. buys from—	U.S. sells to—
Canada United Kingdom EEC	Canada Brazil Australia France United Kingdom Republic of South Africa West Germany

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Construction Machinery—SIC 3531**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments
1958.....	579	95,304	\$2,107	284	1,717	\$36	145	6,656	\$125	150	86,931	\$1,947
1963.....	617	104,520	2,696	312	1,936	45	160	7,721	186	145	94,863	2,465

Source: Bureau of the Census.

**Table 5.—Key Ratios
Construction Machinery—SIC 3531**

Item	1958	1963
Investment per production worker ¹		11,992
Specialization ratio (%).....		91
Concentration ratios%:		
4 firms.....		42
8 firms.....		53
20 firms.....		70
50 firms.....		84

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Construction Machinery—SIC 3531**

Geographic area	All employees	Geographic area	All employees
Total.....	104,520	West North Central.....	10,579
New England.....	747	Minnesota.....	4,038
Massachusetts.....	268	Iowa.....	4,719
Middle Atlantic.....	4,740	Missouri.....	1,134
New York.....	1,163	Nebraska.....	213
New Jersey.....	942	Kansas.....	475
Pennsylvania.....	2,635	South Atlantic.....	1,178
East North Central.....	75,950	East South Central.....	665
Indiana.....	3,658	West South Central.....	4,045
Illinois.....	44,715	Texas.....	2,374
Michigan.....	4,500	Mountain.....	1,161
Wisconsin.....	10,706	Pacific.....	5,455
Ohio.....	12,371	Washington.....	1,141
		Oregon.....	268
		California.....	4,046

Source: Bureau of the Census.

**Table 7.—Principal Products
Construction Machinery—SIC 3531**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Contractors' off-highway wheel tractors, excluding parts and attachments.....	90	92	65	74	79	103	131	175	206	2.29
Tracklaying type tractors, excluding parts and attachments.....	287	323	270	238	257	317	391	430	467	1.62
Parts and attachments for tracklaying tractors and contractors off-highway, wheel tractors and shovel loaders.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	404	455	N.A.
Power cranes, draglines, shovels and parts.....	361	395	359	356	400	465	543	607	687	1.90
Mixers, pavers, and related equipment (excluding parts).....	102	133	107	110	109	132	148	148	173	1.69
Integral tractor-shovel loaders, excluding parts and attachments (see 35319).....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	406	422	N.A.
Scrapers, graders, rollers and off-highway trucks, trailers, and wagons (excluding parts) (see 35319).....	326	366	314	302	362	480	572	641	712	2.19
Other construction machinery and equipment, and parts and attachments.....	N.A.	N.A.	N.A.	N.A.	N.A.	404	501	604	670	N.A.
Construction machinery, N.S.K.....	32	*43	*48	*57	*59	33	*25	*37	*37	N.C.

N.C.=Not computed.

N.A.=Not available.

N.S.K.=Not specified by kind.

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Corrugated and Solid Fibre Boxes— SIC 2653

The "workhorse" of American packaging, the corrugated container, has far outdistanced the fast pace of the U.S. economy as measured by the Gross National Product (GNP). During the 1958-68 period, real GNP growth averaged just under 5 percent per annum, compared with the 6.5 percent rate for corrugated shipping containers.

Of about 1000 corrugated box plants operating within the United States, some are located in every State. In 1968, the industry's 102,000 employees are turning out fibre boxes at the rate of roughly 100 average size boxes for every man, woman, and child in the United States. Sales volume in 1968 will establish another record of an estimated \$3,035 million, and extend the consecutive, annual sales uptrend that followed the 1958 recession.

GROWTH FACTORS

New technology has been a major factor in the growth of the corrugated shipping containers industry. One new product, a waterproof fibre box, has revolutionized the marketing and distribution of fresh meat, fruits and vegetables. The urgent need for weather-resistant solid fibreboard boxes to withstand the adverse weather conditions in Vietnam prompted the industry to speed up outlays on construction, research and development. In the period 1963-66, capital expenditures of the industry vaulted 117 percent, while sales advanced 32 percent.

Through the achievement of higher volume production on newer, wider and faster machines, the industry has been successful in maintaining relatively stable fibre box prices despite an average annual labor cost increase of about 3 percent over the past decade.

Growth has come also from a burgeoning

economy; the successful competitive battles with other types of containers; and from above-average demand from the principal markets of the industry. Because fibre boxes are used by nearly all industries, growth historically has paralleled the pattern of total industrial output. Growth has accelerated in recent years, as fibre boxes have invaded traditional wooden markets.

A sizable expansion in established markets has been realized in such important end-uses as food and beverages; paper products; chemicals, fabricated plastics and Government purchases. The above-average gains in soft drink, beer, and frozen food markets have boosted fibre box sales in this sector to a 32 percent share of total box deliveries. The sharp upswing in Vietnam requirements in the mid-60's and the trend toward nonreturnable beverage containers, stimulated in part by the preferences of the fast-growing 18-25 age group, have accounted for a large proportion of the sales advance in corrugated shipping containers.

Through the upgrading of raw materials by substituting virgin kraft liners and semichemical corrugating medium for that made of waste paper, the industry has produced a lighter and stronger box. With resin coating, the outside liner of the box has high receptivity to inks and colors. Color and other coding methods have enhanced the usefulness of this container in inventory control and warehousing applications. Some consumers have automated the delivery of finished products to their adjacent warehouses by use of this technique.

Corrugated fibre boxes enjoyed a brisk export trade with Latin-American countries in the early 1960's. This business was short-lived, however, as local production facilities were established. Thus, the \$12 million export volume in 1962 has de-

creased to \$4 million in 1967. Imports of fibre boxes in 1967 were appreciably less.

FUTURE PROSPECTS

A definite cloud on the horizon is the relatively new development of shrink film wrapping of unit loads. Used successfully in packaging glass bottles and canned vegetables, a shrink film is applied over a pallet load. The process is said to be cheaper by some 30 percent than conventional corrugated boxes. The new shipper uses only a corrugated bottom case. It is said to permit more secure palletizing of unit loads; it weighs less; and is easier to open. In packaging glass containers, paperboard partitions or dividers are not necessary and the glass container arrives in a clean condition.

Expanded foam products have also made some inroads into fibre box markets. Worth noting is the growing trend toward the use of plastic foam shipping containers in hauling some of California's fruit and vegetable crops to eastern markets.

Despite these threats to the corrugated box, the future looks bright for the industry if it can adapt its product development and merchandising to the dynamics and requirements of its market. Efforts to glamorize corrugated containers for wider market applications are likely to continue.

Although most of the future growth in corrugated container demand will come from established markets, the development of new uses should provide the additional margin necessary to characterize the fibre box industry as a growth industry for some time to come.

**Table 1.—General Statistics
Corrugated and Fibre Boxes—SIC 2653**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	70,792	345,117	53,531	110,517	233,981	596,934	1,635,650	51,955	2.551	2.117
1959.....	77,766	407,516	59,602	126,131	276,411	678,200	1,904,823	N.A.	2.454	2.191
1960.....	79,896	417,987	60,920	125,567	280,850	686,089	1,937,150	N.A.	2.443	2.237
1961.....	79,727	439,768	60,584	127,234	294,258	708,673	1,970,728	50,786	2.408	2.313
1962.....	83,264	473,855	63,680	134,773	320,311	805,861	2,179,049	65,185	2.516	2.377
1963.....	83,229	485,594	62,800	132,289	323,829	804,012	2,166,137	54,094	2.483	2.448
1964.....	86,382	533,974	64,710	140,072	355,326	831,334	2,345,503	71,650	2.340	2.537
1965.....	90,547	578,292	67,645	147,269	388,809	933,067	2,558,598	93,604	2.400	2.640
1966.....	96,064	635,293	73,326	156,899	428,396	1,091,222	2,891,151	117,239	2.547	2.730
1967.....	¹ 99,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 2,950,000	N.A.	N.A.	N.A.
1968.....	¹ 102,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,035,000	N.A.	N.A.	N.A.

¹ Estimated. N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2, 3, and 7 are not relevant to SIC 2653.

**Table 4.—Number of Employees by Size of Establishment
Corrugated and Solid Fibre Boxes—SIC 2653**

[Dollars in Millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	805	70,792	\$1,636	291	2,386	\$51	244	11,642	\$259	270	56,764	\$1,325
1963.....	923	83,229	2,166	272	2,182	55	314	15,248	380	337	65,799	1,731

Source: Bureau of the Census.

Table 5.—Key Ratios
Corrugated and Solid Fiber Boxes—SIC 2653

Item	1963
Investment per production worker.....	\$12, 168
Specialization ratio (%).....	97
Concentration ratios (%):	
4 firms.....	20
8 firms.....	36
20 firms.....	63
50 firms.....	79

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Corrugated and Solid Fibre Boxes—SIC 2653

Geographic area	All employees	Geographic area	All employees
Total.....	83, 229	South Atlantic.....	8, 998
New England.....	5, 020	Maryland.....	1, 341
Maine.....	243	Virginia.....	1, 040
Massachusetts.....	3, 495	North Carolina.....	1, 640
Connecticut.....	997	Georgia.....	2, 031
Middle Atlantic.....	20, 154	Florida.....	1, 554
New York.....	7, 177	East South Central.....	3, 383
New Jersey.....	6, 860	Kentucky.....	877
Pennsylvania.....	6, 117	Tennessee.....	1, 774
East North Central.....	27, 087	Alabama.....	346
Indiana.....	3, 352	Mississippi.....	386
Illinois.....	9, 218	West South Central.....	4, 381
Michigan.....	4, 216	Louisiana.....	1, 545
Wisconsin.....	3, 308	Texas.....	2, 008
Ohio.....	6, 993	Mountain.....	624
West North Central.....	5, 355	Colorado.....	345
Minnesota.....	1, 105	Pacific.....	8, 227
Missouri.....	1, 715	Washington.....	1, 294
Nebraska.....	481	California.....	6, 565
Kansas.....	1, 073		

Source: Bureau of the Census.

Dental Equipment and Supplies Industry

SIC 3843

The Dental Equipment and Supplies Industry has shown rapid and virtually continuous growth in both employment and value of shipments during the past decade. Total employment rose 73 percent from 1958 to 1968, while at the same time, the value of shipments increased 150 percent to over a quarter of a billion dollars. In contrast to many other industries, the average size of establishment in this industry is declining.

Most of the increase in employment has been in the South and Far West, primarily California, which it is estimated now accounts for almost 7 percent of the U.S. total employment and shipments. New York, the capital of this industry, which accounted for almost one-third of the employment in 1958 dropped to only about one-fourth in 1966.

GROWTH FACTORS

The growth of this industry will continue to parallel closely the increasing demand for dental care, which is expected to double in the next 10 years. The major factors influencing this anticipated growth are population increase; changing attitudes toward dental care; rising levels of education and income; improved dental care technology; increased participation in dental insurance plans; and growing and new government programs designed to extend dental care.

With a population by 1980 of more than 100 million under 19 years of age or over 65, these two segments will receive, in the next 10 years, proportionally more dental care than ever before. This trend will largely result from anticipated Federal and State dental care programs. For example, "denticare" is being developed, at a cost of \$1 billion, as a national plan to provide dental care by 1980 for over 20 million children

whose parents cannot afford to pay dentists bills. In addition, plans are being made to bring mobile dental units into low income and rural areas where additional dental care is required. All of these programs will require large quantities of dental equipment and supplies.

The demand for dental care, as well as dental equipment and supplies, is directly related to family income and to educational level. Both of these factors will continue to rise, and with them, a relative increase in requirements for dental care.

Dental insurance plans currently have enrolled 3 to 4 million persons. By the early 1970's, it is estimated that this will increase to about 10 million. A large share will consist of group plans spurred by efforts of labor unions to include dental care as a fringe benefit. Although many would receive dental care regardless of insurance plans, if experience in similar plans is indicative, participation in dental insurance plans will improve the quality of dental care with more emphasis on restoration, replacement, and other more costly types of dental care, than the participants would otherwise receive.

Technological changes in dental equipment have had a large impact on the industry. The introduction of high-speed and less-painful drilling instruments has changed the attitudes of many persons toward dental care. This has increased the productivity of dentists and opened up a new market.

Other factors contributing to the rapid growth of this industry are: accelerated depreciation allowances; the trend toward outfitting additional treatment rooms by many dentists; and a rise in the number of practicing dentists. There has been a marked increase in the number of equipped working areas in dentists' offices as a result of the utilization of auxiliary personnel, such as dental hy-

gienists and dental technicians, to perform specialized tasks.

FUTURE PROSPECTS

Many of the factors responsible for the growth of the industry during the past 10 years will continue to promote substantial growth.

Technological change will also affect this industry. For example, the dentist who desires to work sitting down, as well as standing, will soon be able to do so by replacing much of his equipment, including chairs and peripheral equipment. Another growing practice is the placing of all operating equipment on a mobile stand. Operatory stool and power-operated mobile cabinets which can be pulled chairside will complete the arrange-

ment. Further emphasis will be placed on more sterile operating conditions with the greater use of ultrasonic cleaners, autoclaves, and sterilizers, as well as on better illumination such as the use of a concentrated beam for lighting oral cavities.

Intensive research is being carried on for a material which will withstand rejection when dentures are implanted. At present, cobalt crystal appears to be promising. Another technological advance which will spur the growth of the industry appears to be the bonding of porcelain to acrylic. Porcelain bonding to gold for crowns and cap will also increase because of its cosmetic value as well as durability.

In short, there appears to be every prospect for continuing rapid growth in the production of dental equipment and supplies.

**Table 1.—General Statistics
Dental Equipment and Supplies—SIC 3843**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	7,242	34,773	5,227	10,188	21,077	71,574	115,667	1,517	3.396	2.069
1959.....	7,240	36,322	5,231	10,210	22,096	74,972	118,221	1,764	3.393	2.164
1960.....	7,525	38,072	5,411	10,320	23,185	79,503	125,546	2,819	3.429	2.247
1961.....	7,387	38,057	5,226	10,048	22,222	76,278	124,047	1,286	3.433	2.212
1962.....	7,281	39,062	5,113	9,976	22,620	88,006	139,558	1,887	3.891	2.267
1963.....	8,008	46,080	5,751	11,211	27,144	95,876	147,805	2,735	3.532	2.421
1964.....	8,129	48,129	5,723	11,521	28,158	105,382	164,643	N.A.	3.743	2.444
1965.....	9,117	55,582	6,592	12,570	32,710	124,610	193,953	N.A.	3.810	2.602
1966.....	9,972	62,702	7,028	14,222	37,007	141,778	220,423	N.A.	3.831	2.602
1967.....	¹ 10,900	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 253,450	N.A.	N.A.	N.A.
1968.....	¹ 12,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 291,500	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Dental Equipment and Supplies—SIC 3843**

(Dollars in millions)

Year	Ex-ports	Im-ports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$12.9	³ \$1.2	\$111	11.6	1.1
1959.....	12.2	³ 1.4	113	10.9	1.2
1960.....	13.0	³ 1.5	124	10.5	1.2
1961.....	12.7	³ 1.5	120	10.6	1.2
1962.....	13.4	⁴ 1.7	134	10.0	1.3
1963.....	14.2	⁴ 1.6	140	10.1	1.1
1964.....	15.0	2.7	146	10.3	1.8
1965.....	² 18.8	3.2	171	11.0	1.8
1966.....	² 24.3	3.7	220	11.0	1.7
1967.....	² 27.9	4.2	⁵ 253	⁵ 11.0	⁵ 1.6
1968.....	² 34.2	⁵ 4.7	⁵ 292	⁵ 11.7	⁵ 1.6

¹ New supply consists of shipments plus imports.

² Includes medical and surgical furniture; excludes sterilizers and some dental supplies.

³ Not comparable to output; representing only dental instruments and parts.

⁴ Incomplete; does not include teeth and dental cements having 1964 value of \$0.6 million.

⁵ Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Dental Equipment and Supplies—SIC 3843**

United States buys from—	United States sells to—
United Kingdom	Canada
West Germany	Sweden
Switzerland	Japan
Japan	France
Canada	West Germany

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Dental Equipment and Supplies—SIC 3843**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	249	7,242	\$116	194	934	\$17	39	1,889	\$30	16	4,419	\$69
1963.....	316	8,008	148	250	992	20	47	2,183	43	19	4,833	84

Source: Bureau of the Census.

**Table 5.—Key Ratios
Dental Equipment and Supplies—SIC 3843**

Item	1958	1963
Investment per production worker.....	¹ \$5,196	\$6,616
Specialization ratio (%).....	95	94
Concentration Ratios (%):		
4 firms.....	45	37
8 firms.....	57	50
20 firms.....	73	70
50 firms.....	89	88

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Dental Equipment and Supplies—SIC 3843**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	8,008	West North Central.....	131
New England.....	667	South.....	669
Middle Atlantic.....	3,892	Mountain.....	382
New York.....	2,093	Colorado.....	336
East North Central.....	1,613	Pacific.....	654
Illinois.....	724	California.....	531
Ohio.....	577		

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3843.

Electric Housewares and Fans

SIC 3634

The sustained growth of the electric housewares industry has been spectacular. Manufacturers' shipments in 1968 were \$1.4 billion, 150 percent ahead of the 1958 level of \$559 million. During this period of rapid growth, employment rose from 29,150 to 50,800; and annual industry payrolls climbed from \$129 million to \$288 million.

GROWTH FACTORS

New products have sparked the dynamic growth of the electric housewares industry. A decade ago, American homes did not have such products as electric can openers, cap-type hair dryers, and cordless appliances. The industry's ability to innovate and the consumer's willingness to buy new electric housewares combined to generate rapid expansion during the 1960's. Relatively stable prices for new items and declining prices for older products also have been important selling factors.

Technological developments have made possible many of the industry's new products and many of the changes which have revitalized sales of existing products. Development of small rechargeable batteries led to the introduction of cordless electric carving knives, toothbrushes, shavers, and hair curlers. New heating controls permitted the production of immersible electric skillets and coffee makers. The versatility and appeal of blenders were increased by the addition of variable speed controls and heating capacity.

In addition to the many new items, the old "standbys" accounted for a large share of the growth in the electric housewares market. For example, the number of homes equipped with electric blankets increased nearly threefold during the last 10 years, from about 7.4 million homes in

1958 to over 25 million in 1968. The electric blender, one of today's best sellers, was introduced in 1938; but only in the last decade did it become a volume item. By 1968, 12 million homes had electric blenders, a threefold gain since 1958. Additional industry estimates of market penetration levels show substantial growth for many of the older, but improved, products such as irons, coffeemakers, mixers, and toasters.

Electrified personal care products have also found growing consumer acceptance. Electric hair curlers and facial saunas became "hot sellers" in the late 1960's. The latest product in this group is a makeup mirror that adjusts and duplicates the lighting conditions for daytime, office, and nighttime makeup.

FUTURE PROSPECTS

Continued growth of the electric housewares market rests on the industry's proved ability to create new products and to adapt traditional items to changing times and needs. Products designed to ease household chores will continue to be the base for growth, but expanding sales of personal-care products should contribute significantly to future progress.

Some of the industry's products face an uncertain future. Electric irons, which have had a long history of successive and successful adaptations, are being strongly challenged by new fabrics which require little or no pressing. However, the new electric pants pressers have found a growing market.

Many existing products still have a virtually untapped market. Approximately 80 percent of wired U.S. homes do not have blenders; over 55 percent lack electric blankets; about 48 per-

cent do not have electric frypan skillets; and, 20 percent are not equipped with electric coffee makers.

New products to electrify will be found just as the electric slicing knife electrified the old carving knife. Second-generation products, like the cordless appliances which replaced the first models of electric toothbrushes and knives, can be expected to enlarge the market further. Battery-operated housewares hold increased potential as technology advances with more powerful, longer lasting and lighter weight batteries and motors.

While some of the industry's products will continue to contribute to a reduction in time spent doing household chores, other industry products, principally those for personal care, will gain from the housewife's extra time. Increasing family attention to personal health and appearance offers a promising future market.

In the more distant future, many industry observers expect the electric housewares industry to play a role in the projected home-computer business. While it is not clear what this development would mean in terms of products, it fits into the industry's historical pattern of focusing on advanced products for the home.

**Table 1.—General Statistics
Electrical Housewares and Fans—SIC 3634**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	29,150	128,850	22,477	42,804	84,557	301,033	559,090	9,985	3.560	1.975
1959.....	30,226	139,094	23,815	45,929	93,074	335,014	596,219	10,688	3.599	2.026
1960.....	32,334	152,561	25,833	49,101	101,544	355,716	628,566	11,193	3.503	2.068
1961.....	31,789	151,653	25,308	47,744	99,992	359,976	671,054	8,688	3.600	2.094
1962.....	35,006	170,608	27,922	52,166	112,907	403,992	740,524	10,679	3.578	2.164
1963.....	38,801	188,257	31,053	59,567	126,912	463,845	850,281	17,009	3.655	2.131
1964.....	38,349	190,900	30,332	60,461	128,669	478,390	889,127	14,652	3.718	2.128
1965.....	41,297	211,307	33,891	68,409	144,797	574,414	980,175	26,264	3.967	2.117
1966.....	44,702	236,338	36,599	70,445	161,262	612,665	1,127,789	25,861	3.799	2.289
1967.....	¹ 47,650	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,270,000	N.A.	N.A.	N.A.
1968.....	¹ 50,800	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,435,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Electrical Housewares and Fans—SIC 3134**

(Dollars in millions)

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$24.6	N.A.	\$544	4.5	N.A.
1959.....	24.2	N.A.	582	4.2	N.A.
1960.....	24.0	N.A.	598	4.0	N.A.
1961.....	25.2	N.A.	635	4.0	N.A.
1962.....	24.3	N.A.	719	3.4	N.A.
1963.....	25.0	N.A.	810	3.1	N.A.
1964.....	27.9	N.A.	872	3.2	N.A.
1965.....	29.2	N.A.	1,002	2.9	N.A.
1966.....	33.7	N.A.	1,068	3.2	N.A.
1967.....	33.6	N.A.	² 1,230	² 2.7	N.A.
1968.....	² 35.0	N.A.	² 1,400	² 2.5	N.A.

¹ New supply consists of shipments plus imports.

² Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Data to prepare Table 3 for SIC 3634 were not meaningful.

Table 4.—Number of Employees by Size of Establishment
Electric Housewares and Fans—SIC 3634

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	311	29,150	\$559	206	1,053	\$17	54	2,621	\$49	51	25,476	\$493
1963.....	312	38,801	850	176	863	16	71	3,507	72	65	34,431	762

Source: Bureau of the Census.

Table 5.—Key Ratios
Electrical Housewares and Fans—SIC 3634

Item	1963
Investment per production worker (\$)	\$6,051
Specialization ratio (%)	87
Concentration ratio (%):	
4 firms	41
8 firms	59
20 firms	78
50 firms	92

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Electrical Housewares and Fans—SIC 3634

Geographic area	All em- ployees	Geographic area	All em- ployees
Total	38,801	East North Central—Cont.	
New England	5,403	Wisconsin	2,330
Massachusetts	269	West North Central	2,833
Middle Atlantic	6,498	Missouri	2,676
New York	4,220	South Atlantic	3,195
East North Central	12,676	North Carolina	2,064
Illinois	7,022	East South Central	5,443
Michigan		Tennessee	2,425
		West South Central	1,211
		West	1,542
		California	1,387

Source: Bureau of the Census.

Table 7.—Principal Products
Electric Housewares and Fans—SIC 3634

[Dollars in millions]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Electric fans, except industrial type	77	68	76	70	84	102	116	98	99	1.29
Electric razors and dry shavers	54	55	49	56	48	53	51	76	78	1.44
Other small household electric appliances	336	378	394	425	497	563	612	701	764	2.27
Parts and attachments for small household electric appliances	56	72	71	76	78	82	83	*113	*111	*2.00
Electric housewares and fans, N.S.K.	21	*9	*9	*9	*11	10	10	*14	*16	N.C.

*Standard error of estimate of 15 percent or more.
N.C. Not computed.

N.S.K. = Not specified by kind.

Source: Bureau of the Census.

Elevators and Moving Stairways

SIC 3534

Shipments and employment within the elevator and moving stairway industry have closely reflected the growth in building construction and the general growth of the economy during the last decade. Between 1958 and 1968, the industry increased its shipments by more than 90 percent and generated an increase in employment of about 49 percent.

While this industry is widely dispersed over the country with 95 companies in 25 states, 83 of these companies are located in the Eastern and Midwestern States. Approximately 60 percent of industry shipments are accounted for by four companies.

GROWTH FACTORS

The underlying trend which has assured continued growth for this industry is the increasing population pressure in urban areas. The construction of apartment housing and commercial buildings has been crucial to meeting the steadily increasing needs of people both in the downtown areas and the growing suburban sectors.

The elevator and moving stairway industry plays an integral role in handling the increasingly complex problem of human traffic within urban areas. Elevators are indispensable components in every multistoried, large structure in which people and freight must move from one level to another. Moving stairways are a vital element in public places where a very large number of people must be moved quickly from one floor to another, as in large department stores and transportation terminals.

The industry has aggressively promoted its products through effective marketing and servicing techniques. By continuously maintaining contacts with architects and building contractors, the in-

dustry has been able to adapt its line of products to the specific needs of designers and builders. It has developed effective servicing organizations, largely because elevators and moving stairways require a considerable degree of custom engineering during installation, and must be kept in steady operation. Personnel skilled in the installation and repair of elevators must be readily available.

The basic function of elevators and moving stairways has not permitted great latitude in design and construction—in this area, the industry has hit a plateau. However, manufacturers have taken advantage of technological innovations that are adaptable to elevators and moving stairways. In recent years, the industry has incorporated very sophisticated automated equipment such as electronic controls, signalling devices and door operating mechanisms, all which have helped to make them faster, smoother in operation, more attractive and more versatile.

Exports to developing nations are growing—mainly because these areas do not have an established domestic industry to meet the needs of their building construction. The United States does not import a significant number of elevators and moving stairways. The engineering skill necessary for installation, (which the manufacturer usually must provide) means that foreign firms encounter difficulty in promoting their products effectively within U.S. markets. U.S. firms in this industry do not export extensively to other industrial nations because these countries generally have their own established elevator industry. Recently (1967 and 1968), there has been a marked increase in imports of parts and auxiliary equipment manufactured by overseas subsidiaries of U.S. firms.

FUTURE PROSPECTS

To the extent that building construction, in the long run, is dependent upon population growth, the outlook for the industry appears to be good over the next decade. The U.S. Census Bureau estimates a U.S. population level of 227

million or more in 1980 with an increasing percentage of total U.S. population living in urban areas. These increases in urban population, assuming the present rate of economic growth, will generate continuing need for structures, both residential and commercial, which will utilize elevators and moving stairways.

Table 1.—General Statistics
Elevators and Moving Stairways—SIC 3534

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	9,626	55,657	5,868	11,764	31,156	126,270	192,806	2,321	4.053	2.648
1959.....	9,323	55,893	5,542	11,723	31,579	135,225	216,778	N.A.	4.282	2.694
1960.....	8,909	59,745	5,311	10,469	31,751	149,732	235,405	1,319	4.716	3.033
1961.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1962.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1963.....	12,393	88,389	7,427	15,458	49,634	201,527	318,616	3,315	4.060	3.211
1964.....	13,415	95,337	8,053	15,775	50,025	234,139	347,427	5,154	4.680	3.171
1965.....	13,361	99,627	8,053	17,064	55,192	217,776	339,064	11,318	3.946	3.234
1966.....	13,960	105,090	8,451	17,820	58,132	235,523	352,601	4,266	4.052	3.262
1967.....	¹ 13,990	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 356,127	N.A.	N.A.	N.A.
1968.....	¹ 14,348	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 373,733	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Elevators and Moving Stairways—SIC 3534

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$5.8	N.A.	\$165	3.5	N.A.
1959.....	5.0	N.A.	187	2.7	N.A.
1960.....	4.5	N.A.	205	2.2	N.A.
1961.....	4.6	N.A.	196	2.3	N.A.
1962.....	4.8	N.A.	232	2.1	N.A.
1963.....	4.1	N.A.	248	1.7	N.A.
1964.....	6.2	\$0.7	267	2.3	0.3
1965.....	8.3	1.1	261	3.2	.4
1966.....	8.8	.9	280	3.1	.3
1967.....	7.8	1.9	² 286	² 2.7	² .7
1968.....	² 9.0	² 6.9	² 300	² 3.0	² 1.9

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Elevators and Moving Stairways—SIC 3534

United States buys from—	United States sells to—
Belgium Canada West Germany United Kingdom	Belgium Canada Chile Jamaica Mexico Philippine Republic United Kingdom Venezuela

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Elevators and Moving Stairways—SIC 3534

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments
1958.....	144	9,626	\$193	68	517	\$8	59	2,706	\$43	17	6,403	\$141
1963.....	142	12,393	319	68	448	10	50	2,153	51	24	9,792	258

Source: Bureau of the Census.

Table 5.—Key Ratios
Elevators and Moving Stairways—SIC 3534

Item	1958	1963
Investment per production worker.....	N.A.	\$9,101
Specialization ratio (%).....	97	97
Concentration ratios (%):		
4 firms.....	62	62
8 firms.....	71	73
20 firms.....	82	85
50 firms.....	93	95

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Elevators and Moving Stairways—SIC 3534

Geographic area	All employees	Geographic area	All employees
Total.....	12,393	Ohio.....	1,182
New England.....	424	West North Central.....	181
Middle Atlantic.....	7,035	Minnesota.....	114
Pennsylvania.....	496	West.....	876
East North Central.....	2,467	California.....	790
Indiana.....	262	South.....	1,410

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3534.

Farm Machinery and Equipment

SIC 3522

Mechanization of farming has increased demand for harvesters, tractors, and other farm machinery. Value of shipments nearly doubled to an estimated \$4,550 million between 1958 and 1968, while employment increased about 35 percent. U.S. production of farm machinery and equipment has been close to capacity for the past 2 years.

GROWTH FACTORS

Growth in the farm machinery industry is based on the necessity of producing more per acre and per man-hour. Mechanization was necessitated by steadily increasing labor costs and the desire, on the part of farmers, to put available land under intensive cultivation.

The capital investment required to increase productivity is largely responsible for the trend toward large farms at the expense of small farms. The movement toward larger farms will further the growth in sales of farm machinery, as large farms are the equipment industry's best customers for sophisticated products. The replacement market also supplies a source of continuous growth and expansion in larger, more efficient types of equipment.

Weather conditions are another consideration. Optimum conditions for harvesting many crops last only a few days.

The faster the work can be accomplished, the greater the yield. Generally, it is nearly impossible to get enough laborers into the fields to do the job as fast as the machines can.

Developments in horticulture and chemistry also effect farm machinery sales. More arable land is available by improved fertilizers and insecticides. Heavy earthmoving equipment is used to change the land contours in some areas to make more land usable for farming.

New advances in machinery and equipment technology are necessary to handle expected population increases in the United States and abroad. By 1975, the United States will need more than 700 million acres of cropland, whereas today about 500 million acres are under cultivation.

Machinery, along with technology, will be necessary to close this gap. Besides increasing production per man-hour, equipment permits more efficient use of land to increase total production.

The export market for farm machinery and equipment has expanded significantly since 1958, averaging more than 9 percent increase each year. Of the total exports from this industry, about 60 percent go to Canada. The majority of the remaining products are shipped to Central and South America. Exports of wheel tractors and parts amount to approximately 40 percent of all industry exports each year.

Europe and the United Kingdom are making progress toward highly mechanized farming. In the rest of the world, however, agriculture is still in the developmental stages. Prospects for growth in new machinery sales in Southeast Asia, Australia, parts of Africa, and South America are good. These markets are barely tapped and offer tremendous growth potential.

U.S. imports of farm machinery and equipment have also increased over the past few years, although the dollar value has been substantially below that of exports. About 70 percent of total U.S. farm machinery imports are of Canadian origin. It should be noted that service and replacement parts are important factors in sales. Many foreign manufacturers have been unable to penetrate the U.S. market because they cannot provide adequate service.

Foreign trade is heavily weighted by Canadian imports and exports. This is the result of branches, subsidiaries, and retail outlets of major U.S. manufacturers of farm machinery and equipment being located there. Imports are duty free and flow back and forth between the two countries causing the value of trade to rise substantially.

The overall balance-of-payments position has been favorable to the United States since 1958. Imports have averaged about 53 percent of exports each year since 1958. Exports and imports are still a relatively small percentage of total shipments.

FUTURE PROSPECTS

The future will see increasing growth of the agricultural machinery manufacturing industry

and more technological advancements to increase productivity per man-hour and per acre.

As cotton used to be picked and harvested by sharecroppers, automatic cottonpickers are now commonplace. Cultivation of fruits and vegetables is highly mechanized. Harvesting machines now make use of photoelectric cells that detect which plants are ready for picking.

Although the number of tractor units on farms has leveled off during the past few years, the average horsepower of those in use continues to increase. This results in much greater output per man-hour and puts added emphasis on the production of more expensive, larger equipment.

Technological innovations will continue to contribute substantially to total volume of machinery sales.

**Table 1.—General Statistics
Farm Machinery and Equipment—SIC 3522**

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	108,586	550,998	79,922	153,962	373,240	1,087,836	2,421,873	54,655	2.915	2.424
1959.....	113,153	617,791	84,803	167,685	423,986	1,172,210	2,559,491	42,824	2.765	2.528
1960.....	99,115	540,245	71,110	141,666	355,533	941,021	2,162,640	55,636	2.647	2.510
1961.....	102,538	579,271	76,371	150,710	382,040	1,057,083	2,339,537	45,946	2.767	2.535
1962.....	106,222	618,178	77,139	151,709	413,012	1,205,892	2,481,979	42,999	2.920	2.722
1963.....	112,614	689,122	84,650	168,911	476,827	1,328,381	2,842,243	64,431	2.786	2.823
1964.....	118,621	769,929	90,215	181,852	538,261	1,526,068	3,204,084	83,594	2.835	2.960
1965.....	123,241	818,952	93,941	188,710	573,088	1,682,339	3,529,619	86,708	2.936	3.037
1966.....	137,341	966,333	105,181	213,670	679,389	2,057,136	4,332,018	108,933	3.028	3.180
1967.....	¹ 137,700	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 4,420,000	N.A.	N.A.	N.A.
1968.....	¹ 138,100	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 4,550,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Farm Machinery and Equipment—SIC 3522**

[Dollars in millions]

Year	Exports	Imports	Product shipments ²	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$215.8	\$122.3	\$2,202	9.8	5.3
1959.....	254.0	169.1	2,332	10.9	6.8
1960.....	246.7	134.7	1,979	12.5	6.4
1961.....	247.6	114.1	2,057	12.0	5.3
1962.....	264.0	150.9	2,266	11.6	6.2
1963.....	318.0	175.3	2,542	12.5	6.5
1964.....	413.1	180.4	2,873	14.4	5.9
1965.....	440.2	221.6	3,142	14.0	6.6
1966.....	443.3	292.0	3,867	11.5	7.0
1967.....	445.3	315.4	³ 4,000	³ 11.1	³ 7.3
1968.....	³ 374.5	³ 293.3	³ 4,100	³ 9.1	³ 6.6

¹ New supply consists of shipments plus imports.

² Includes lawnmowers.

³ Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Farm Machinery and Equipment—SIC 3522**

United States buys from—	United States sells to—
Canada	Canada
United Kingdom	Mexico
Belgium	United Kingdom
Italy	France
West Germany	Australia
France	West Germany
	Republic of South Africa
	Venezuela
	Chile

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Farm Machinery and Equipment—SIC 3522

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments
1958.....	1,469	108,586	\$2,422	960	5,602	\$104	351	15,456	\$300	158	87,528	\$2,018
1963.....	1,568	112,614	2,842	1,010	5,854	115	407	18,057	398	151	88,703	2,329

Source: Bureau of the Census.

Table 5.—Key Ratios
Farm Machinery and Equipment—SIC 3522

Item	1958	1963
Investment per production worker.....	N.A.	\$10,843
Specialization ratio (%).....	N.A.	89
Concentration ratios (%):		
4 firms.....	N.A.	43
8 firms.....	N.A.	55
20 firms.....	N.A.	67
50 firms.....	N.A.	77

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Farm Machinery and Equipment—SIC 3522

Geographic area	All em- ployees	Geogr. phic area	All em- ployees
Total.....	112,614	Virginia.....	527
New England.....	190	North Carolina.....	1,299
Middle Atlantic.....	5,090	Georgia.....	1,653
New Jersey.....	198	Florida.....	426
East North Central.....	52,899	East South Central.....	9,222
Indiana.....	5,222	Tennessee.....	2,738
Illinois.....	23,567	Alabama.....	898
Michigan.....	5,230	West South Central.....	2,596
Wisconsin.....	12,480	Arkansas.....	284
Ohio.....	6,400	Louisiana.....	515
West North Central.....	33,252	Oklahoma.....	369
Minnesota.....	5,476	Texas.....	1,428
Iowa.....	21,605	Mountain.....	1,116
Missouri.....	2,080	Idaho.....	303
North Dakota.....	350	Colorado.....	425
South Dakota.....	192	Arizona.....	203
Nebraska.....	1,582	Utah.....	139
Kansas.....	1,967	Pacific.....	3,793
South Atlantic.....	4,456	Washington.....	341
		California.....	3,122

Source: Bureau of the Census.

Table 7.—Principal Products
Farm Machinery and Equipment—SIC 3522

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Wheel tractors and parts and attachments, excludes garden and contractors off-highway.....	687	1,738	1,511	1,601	1,684	808	931	1,082	1,351	1.97
Planting, seeding, and fertilizing machinery.....	101	111	98	96	105	116	131	137	156	1.54
Plows, listers, harrows, rollers, pulverizers, and stalk cutters.....	166	183	146	146	163	193	221	232	276	1.66
Harvesting machinery and parts.....	312	344	324	309	319	395	440	513	607	1.95
Haying machinery and parts.....	176	164	140	124	126	134	139	156	176	1.00
Lawn mowers and parts.....	240	249	238	222	245	269	286	295	375	1.56
Farm machinery and equipment N.S.K.....	35	*2	*2	*3	0	71	86	*56	*71	N.C.
Farm dairy machinery, elevators, blowers, sprayers and dusters and all other farm machinery and equipment...	485	541	519	555	624	556	639	671	855	1.76

¹ Excludes value of parts sold to other plants producing tractor wheels.

N.C.=Not computed.

N.S.K.=Not specified by kind

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Fiber Cans, Tubes and Drums

SIC 2655

The pattern of rapid growth, which has characterized this widely diversified industry since the development of the composite can for refrigerated dough in the early 1950's, shows no sign of abating. Industry shipments more than doubled in the 1958-68 period.

Employment in this industry has risen over 50 percent during the past decade to an estimated 16,500 workers in more than 250 plants. Output is concentrated largely in the Middle Atlantic, East North Central, and South Atlantic areas.

GROWTH FACTORS

The dramatic technical breakthrough which made a "marriage" of competing materials—paper and aluminum—transformed this industry into a viable, dynamic growth industry. Extremely thin-gage aluminum foil laminated to kraft paper and, in some constructions, plastic films and thin steel, are combined to produce fiber cans which have made serious inroads into traditional metal can markets. Over the past 7 years, the bulk of the frozen fruit concentrate and motor oil markets have been taken over by the composite fiber can. In addition to having most of the advantages of the metal can, the fiber can in most cases is more economical and considerably lighter than its competitor.

The enormous success of the composite can has stimulated the industry to secure even greater market opportunities. In 1966, the industry spent \$50 million on capital investment, compared with the \$7 million average spent annually for this purpose in the 1958-65 period.

The range of available graphics choices and the more efficient handling, filling and closing of fiber

cans on the packaging line have maintained the competitive edge enjoyed by the industry.

The composite fiber can now challenges the all-metal can as a container for roasted and ground coffee. Through the development of a fiber can that withstands vacuum and gas flushing and runs on only slightly modified equipment, the industry is poised for greater market penetration.

The technical know-how, equipment and materials utilized in development of composite containers for products not requiring a perfect hermetic seal are providing a firm base for the evolution of new elite composite containers. A relatively new development in Sweden appears promising for the industry's expansion efforts. A Swedish company has recently developed a composite beer bottle of plastic, encased in fiber, that has a shelf life of 8 weeks. Aside from the possibly tremendous market opportunities for such a product in the United States, the container can be burned.

The industry has been resourceful in solving problems of the fiber can. One of these was leakage of motor-oil containers. A lid-sealing system was introduced which has greatly reduced oil leakage. Another is the difficulty in opening frozen fruit concentrate cans with conventional can openers. Many in the industry have solved this problem by adopting the easy-open features of aluminum-top cans and tear tabs.

Recent sharp growth in fiber drums has been attributed to their first-time use for shipping liquids. The use of plastics, particularly polyethylene, has made practical the use of drums for this purpose after nearly 50 years of use in shipping such dry products as powders, crystals, and granular materials. Moreover, the straight-sided kraft paper cylindrical fiber drum of the past half-cen-

tury now is available in a wide range of sizes, shapes, and styles, which is enhancing demand for a greater variety of end uses.

FUTURE PROSPECTS

The increasing affluence of American consumers and their willingness to pay a premium for convenience packaging offers a containing challenge and opportunity to the fiber cans and drum in-

dustry. New techniques and more diverse combinations of materials will be needed to encourage new uses for these versatile containers. Competition from other containers to provide greater product protection at lower cost will likely grow keener. To meet the competitive threats of the future, the industry must expand its human efforts and financial outlays on research and development. Acceptance of its products has established a sound base for future growth.

Table 1.—General Statistics
Fiber Cans, Tubes, Drums—SIC 2655

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	10,971	47,855	9,250	18,399	36,527	79,548	165,627	8,268	2.178	1.985
1959.....	11,266	51,235	9,433	19,456	39,034	85,606	177,431	4,880	2.193	2.006
1960.....	11,294	51,897	9,488	19,064	39,140	84,912	173,644	4,371	2.169	2.053
1961.....	11,695	55,461	9,695	19,730	41,523	94,500	189,601	7,038	2.276	2.105
1962.....	12,205	59,880	10,192	22,108	44,441	104,480	212,956	6,939	2.351	2.010
1963.....	13,188	67,488	11,221	22,816	50,275	126,196	260,257	7,689	2.510	2.203
1964.....	13,280	71,300	11,061	22,919	55,137	134,398	278,539	7,913	2.438	2.406
1965.....	14,591	81,499	12,573	25,254	62,982	153,244	315,322	12,850	2.433	2.494
1966.....	15,642	91,390	13,473	27,909	71,806	168,156	352,987	50,277	2.342	2.573
1967.....	¹ 15,900	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 380,000	N.A.	N.A.	N.A.
1968.....	¹ 16,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 415,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 2655.

Table 4.—Number of Employees by Size of Establishment
Fiber Cans, Tubes, Drums—SIC 2655

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	198	10,971	\$166	86	639	\$9	82	3,850	\$60	30	6,482	\$97
1963.....	246	13,188	260	109	849	17	106	5,423	108	31	6,916	135

Source: Bureau of the Census.

Table 5.—Key Ratios
Fiber Cans, Tubes, and Drums—SIC 2655

Item	1963
Investment per production worker.....	\$8,481
Specialization ratio (%).....	95
Concentration ratios (%):	
4 firms.....	57
8 firms.....	72
20 firms.....	82
50 firms.....	92

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Fiber Cans, Tubes, and Drums—SIC 2655

Geographic area	All employees	Geographic area	All employees
Total.....	13,188	East North Central—Continued	
New England.....	1,034	Ohio.....	1,435
Middle Atlantic.....	3,264	West North Central.....	870
New York.....	753	South Atlantic.....	3,001
New Jersey.....	1,354	North Carolina.....	230
Pennsylvania.....	1,157	Georgia.....	351
East North Central.....	3,226	Florida.....	142
Indiana.....	375	East South Central.....	601
Illinois.....	855	Tennessee.....	210
Michigan.....	242	West South Central.....	388
Wisconsin.....	319	Texas.....	202
		West.....	804

Source: Bureau of the Census.

Table 7.—Principal Products
Fiber Cans, Tubes, Drums—SIC 2655

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Paperboard and other fiber drums.....	55	63	61	62	69	62	69	73	87	1.57
Fiber cans, tubes and other fiber products.....	134	141	136	148	170	237	259	313	333	2.49
Fiber cans, tubes, drums, etc., N.S.K.....	N.A.	N.A.	N.A.	N.A.	N.A.	3	*4	*3	*4	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.C.=Not computed.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Frozen Fruits, Juices and Vegetables

SIC 2037

The industry has experienced an extraordinary rate of growth during the past decade. Value of shipments more than doubled from 1958 to 1968. Employment grew to 60,000 in 1968, 52 percent over 1958. The number of establishments increased 53 percent from 1958 to 1963, and capital expenditures, which were \$21 million in 1958, climbed to \$82 million in 1966 and totaled \$380 million for the 9 years. Much of the industry's growth has taken place in the Southern and Western States as a result of the expansion in the frozen fruit and vegetable sector of the industry, while frozen citrus juices have accounted for the increased employment in the Eastern and Southern regions. Decreases in employment, however, were evident in 1967 and may gather momentum in 1968 as automation and mergers continue. There has also been some exodus of large packers from the West Coast to Mexico.

GROWTH FACTORS

Although quality is considered the cornerstone of the frozen foods industry, its success can be attributed to a process which preserves the taste of a food more like that of the fresh (and freshly prepared) product than does any other preservation method. The freezing process which allows ripened fruits and vegetables to be shipped thousands of miles and still retain a good deal of the fresh taste and flavor has opened up markets countrywide.

Technological and marketing innovations, large advertising budgets by the leaders in the field, stress on quality, rising personal incomes, and the convenience aspect of quick and easy meal preparation have been the important growth factors.

Starting with the method of freezing packaged food in batches by means of the pressure-plate system, the industry went on to a conveyor belt moving through a large blast freezing chamber. Later, the IQF—individually quick frozen—concept was applied to fluidized-bed freezing, whereby a cold blast suspends the product in the air and individually freezes small fruits and vegetables, such as green peas, corn, beans, diced and french-fried potatoes and strawberries. This method cut freezing time and reduced investment costs and floor space requirements.

The introduction of liquid nitrogen for lowering temperatures to minus 320° F. has provided the industry with really “quick” freezing and is eliminating icing and mechanical refrigeration in the transportation of frozen foods.

Through marketing innovations, the industry has been able to sell an ever increasing volume of products. The packaging of frozen vegetables in 1- and 2-pound plastic bags has moved greater amounts of food and benefited the consumer pricewise. Partially or completed prepared frozen items which incorporate preparation, convenience, and “chef service” have improved the competitive position of the freezing industry.

The period since 1958 has been an era of great competition and consolidations. Those who entered the field early, after World War II, have grown in size and in financial strength. Competition became intense as large firms from other food fields and even from other industries took on frozen foods. In addition, mergers have been made within and from outside the industry. Although labor and other costs have continued to rise, the frozen food industry has been able to keep prices relatively stable through use of new and improved auto-

mated machinery, not only in the freezing process and in the preparation of the food, but also in the harvest.

FUTURE PROSPECTS

Expansion of the industry will continue as more foods will be preserved by the quick-freezing method. The population increase, the rising number and proportion of women employed outside the home, and the steady flow of new convenience products, such as heat-and-serve specialties and

prepared vegetables in the boilable bag, will boost future sales.

Of great importance to future growth is the developing volume of institutional business. As resistance to frozen foods by the chef is rapidly being overcome, increasing costs of institutional food preparation will spur the adoption of mass production of frozen entrees and gourmet foods by restaurants, hotels, hospitals and other mass feeding places. The perfecting of the quick-heating microwave oven is another incentive for institutional use of frozen foods.

**Table 1.—General Statistics
Frozen Fruits and Vegetables—SIC 2037**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	39,528	126,804	34,138	66,278	96,858	323,789	1,025,877	20,952	3.343	1.461
1959.....	41,924	140,836	36,027	71,272	107,307	345,983	1,111,831	23,094	3.224	1.506
1960.....	43,810	154,533	37,787	75,767	119,869	401,988	1,206,571	28,676	3.354	1.582
1961.....	45,144	164,721	38,844	77,057	126,287	403,044	1,274,645	28,357	3.191	1.639
1962.....	45,399	175,122	38,563	77,396	132,996	428,801	1,323,731	40,099	3.224	1.718
1963.....	51,750	202,398	44,689	86,664	154,406	550,231	1,548,663	44,569	3.564	1.782
1964.....	53,553	218,462	46,277	91,435	168,829	560,550	1,651,639	49,951	3.320	1.846
1965.....	58,807	245,143	50,774	100,164	189,915	627,010	1,816,049	62,916	3.302	1.896
1966.....	62,281	265,618	54,644	105,860	208,257	679,024	1,884,567	81,856	3.261	1.967
1967.....	¹ 61,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,806,448	N.A.	N.A.	N.A.
1968.....	¹ 60,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 2,140,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 2037.

**Table 4.—Number of Employees by Size of Establishment
Frozen Fruits and Vegetables—SIC 2037**
[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments ¹	Establishments	Employees	Shipments ¹	Establishments	Employees	Shipments ¹	Establishments	Employees	Shipments ¹
1958.....	426	39,528	\$1,026	163	1,354	\$35	138	6,755	\$175	125	31,419	\$817
1963.....	650	51,750	1,549	304	2,041	55	194	9,500	298	152	40,209	1,195

¹ Value of production.

Source: Bureau of the Census.

**Table 5.—Key Ratios
Frozen Fruits and Vegetables—SIC 2037**

Item	1963
Investment per production worker.....	\$9,169
Specialization ratio (%).....	89
Concentration ratios (%):	
4 firms.....	24
8 firms.....	37
20 firms.....	54
50 firms.....	70

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Frozen Fruits and Vegetables—SIC 2037

Geographic area	All em- ployees	Geographic area	All em- ployees
Total	51,750	South Atlantic	10,269
New England	2,428	Delaware	558
Maine	2,096	Maryland	1,312
Middle Atlantic	6,204	Florida	5,267
New Jersey	2,994	East South Central	1,477
East North Central	4,867	Kentucky	205
Illinois	2,440	West South Central	3,370
Wisconsin	157	Louisiana	342
Ohio	1,074	Texas	1,497
West North Central	5,263	Mountain	2,866
Minnesota	1,672	Idaho	2,579
		Pacific	15,006
		Oregon	3,932
		California	8,144

Source: Bureau of the Census.

Table 7.—Principal Products
Frozen Fruits and Vegetables—SIC 2037

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Frozen fruits, juices and ades	358	416	415	433	421	436	449	414	421	1.18
Frozen vegetables	231	*234	*271	*289	*291	396	439	512	565	2.44
Frozen prepared foods and soups	319	340	434	474	539	608	646	765	838	2.63
Frozen fruits and vegetables, N.S.K	8	*9	*4	*1	N.A.	20	25	*19	*19	N.C

* Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.A.=Not available.

Source: Bureau of the Census.

Industrial Gas Cleaning Equipment

SIC 3564

Growth in the production of air pollution control equipment over the next 10 years is virtually guaranteed by passage of the Air Quality Act of 1967.

This act authorizes the Secretary of the Department of Health, Education, and Welfare to establish air quality control regions, to develop and issue air quality criteria, to issue recommended air pollution control techniques, and generally to work with State and local governments to advance pollution control.

The problem of public administration will be to attain the objectives of clean air with a reasonable balance of costs and benefits. This will require a close cooperation of industry and government.

The industrial gas cleaning equipment industry increased its output by 120 percent between 1963 and 1967 for an annual growth rate of 17 percent, according to a Commerce Department report of August 7, 1968. This rate of growth is expected to increase under the impetus of the Air Quality Act.

GROWTH FACTORS

Air pollution control has long been a recognized objective of public policy based primarily on the local police power to control nuisances. The rather minimal regulations under pre-Air Quality Act local pollution control standards created some demand for pollution control technology and a demand for a small output of special equipment.

While air pollution has many aspects, the types of control equipment under consideration here apply to air pollution from industrial processes; e.g., from steel mills, refineries, pulpmills, food processing, powerplants, cement mills, etc. This excludes pollution from transportation equipment—motor vehicles, airplanes, and railroad

trains. It does include incineration and commercial space heat pollution.

Industrial air pollution control equipment manufacturing includes devices such as electrostatic precipitators; fabric filters or baghouses; mechanical collectors; scrubbers; catalytic, thermal, and flame incinerators; gas adsorbers; and gaseous emission scrubbers. The equipment, which is produced by some 68 companies, is classified within the broad category of SIC 3564, blowers and exhaust and ventilating fans, which includes devices for controlling and moving air as well as for cleaning air.

Air pollution, a byproduct of industrial civilization, increases with the growth and complexity of the gross national product. Pollution can be measured in terms of tons of waste dumped into the air. The increasing use of insecticides, the poisons released by complex chemical processes, and the reactions among pollutants which take place in the atmosphere all contribute to the pollution problem. Pollutants include particulates, sulphur dioxide, carbon monoxide, and petrochemicals; excess heat is also a pollutant under certain conditions.

Although no one has been able to attach a dollar estimate to the magnitude of the current air pollution problem in this country, it is generally recognized that the effects of pollution are severe. Mainly, there is a discomfort from grime, dust, and odors. There is a cost burden from the requirements of repainting, cleaning, and prevention of deterioration.

There are the psychological effects of living in unpleasant surroundings. Finally, and perhaps most important, there are the dangerous effects on health.

Pollution imposes a burden of cost or discomfort upon persons outside the economic responsibility

of the individual pollutor. Because of this external nature, pollution is often controlled only when sanctions against pollution are enforced by law, custom, or informal public pressure. The sanctions are then a contributing factor in the growth of control equipment sales.

FUTURE PROSPECTS

An increasing standard of living is a goal of the national economy. As the potential air pollution problem increases with each increase in material output, greater efforts will be required to contain pollution.

Under the Air Quality Act of 1967, State and local governments have the prime responsibility for air pollution control. As the States move into this area of responsibility, there will be greater demand for the control equipment. Because the States differ widely in the urgency of the problem, it can be expected that the demand for air pollution control equipment will be spread over a fairly long period, at least the next 10 years.

The timelag between initiation and completion of pollution control will be generally advantageous because too big a burden will not be imposed on the control equipment industry or the economy at the same time.

Design of air pollution control equipment is based on generally well known scientific principles such as combustion, filtration, electrical attrac-

tion, and centrifical forces. Advances in technology that could lead to high growth in the equipment industry are largely in the area of better materials and better processes control, rather than in basic changes in pollution control techniques.

Modest improvements will no doubt be made, but major breakthroughs to new methods are not currently on the horizon.

Pollution control can be achieved by means other than installation of equipment. Obvious alternatives are relocation of plants to less populated areas, change of raw materials, change of processes, and removal of pollutants before combustion. Some very effective controls can be achieved merely by changing the operation to a different time of day or a different season of the year. Each of these alternatives may be seen as a limiting factor on the growth of the equipment supplying industry.

Often the combination of pollution control equipment with one or several of the alternatives mentioned above is the most economical solution. Pollution control is a system in which several techniques work together to achieve a desired result at an economical cost. Perhaps it is in this area of systems services that the air pollution control equipment industry can find an even larger area for growth.

Data are not available to prepare statistical tables for industrial gas cleaning equipment.

Industrial Process Controls

SIC 3622

In the process of becoming a billion-dollar business, the industrial controls industry chalked up gains of 173 percent in shipments and 70 percent in employment between 1958 and 1968.

The industrial controls industry is heavily concentrated in the east north central section of the United States, with Wisconsin alone accounting for over one-third of the industry's employment in 1963. The industry is also concentrated in that 56 percent of its shipments are produced by only four firms and 90 percent is accounted for by 50 firms.

GROWTH FACTORS

The healthy growth in demand for industrial controls stems from two major factors—general economic expansion and increasing automation of U.S. industry.

All motors require controls, if only for starting and stopping. Since virtually all manufacturing processes employ machinery run by motors, the demand for industrial controls spreads throughout the industrial sector.

The U.S. economy has experienced a period of unprecedented growth and prosperity over the last decade. The expanding demand for goods and the favorable prospects for continuing growth have led businessmen to lay out tremendous amounts of capital for plant and equipment. In 1958, \$12 billion was expended by manufacturers on plant and equipment. By 1966, the total was \$27 billion. Shipments of motors and generators rose by almost \$1 billion during the same period. As a result, the demand for industrial controls has also risen sharply.

Increasing automation of manufacturing activi-

ties in the United States has been the other key factor in the growing demand for industrial controls. As labor costs have risen and technological breakthroughs have occurred, mechanization and automation has accelerated. This trend is reflected in the rapidly rising shipments of pilot circuit devices, controls for packaged adjustable speed drives, and specially engineered control assemblies, all of which are basic elements of automated systems.

Substantial investments have been made to develop and improve industrial controls. During the past decade, the principal improvements have been in refining existing products. Today's controls are basically magnetic, as they were 10 years ago. However, there has also been rapid growth in the fields of electronic and solid state controls, although these are relatively small in volume.

Exports of industrial controls doubled between 1958 and 1966, but accounted for less than 4 percent of total product shipments in 1966.

FUTURE PROSPECTS

The future of the industrial controls industry is tied closely to the volatile business investment sector of the economy and to the demand for goods. Every indication points to a 4 percent average real annual growth in the U.S. economy over the next 10 to 15 years. With the demand for goods rising steadily, the business community may be expected to continue substantial outlays for plant and equipment. All this portends further rapid growth in demand for industrial controls.

Now that automation is becoming widely accepted as a boon rather than a disaster for the U.S. economy, it will spread even more rapidly. Industrial controls are the key link in integrating

automated systems, and should benefit substantially from the increased use of such systems.

Development of solid state controls may have a substantial impact on the industry over the next decade. The compactness, durability, and flexibility of solid state controls may significantly expand their share of the market, even to the point of replacing existing magnetic controls. The industry is now conducting intensive research to

overcome problems of protection during shutdown periods and low-power capacity that now restrict the utility of solid state controls.

Foreign demand for controls is expected to accelerate. U.S. firms have the advantages of advanced technology and a mass market which enhance their ability to compete in foreign markets. As a result, exports of industrial controls should continue to grow moderately.

**Table 1.—General Statistics
Industrial Controls—SIC 3622**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	27,150	145,270	17,311	33,660	81,769	281,890	413,163	7,611	3.447	2,429
1959.....	28,227	165,574	19,190	38,744	97,893	349,843	496,681	9,796	3.574	2,527
1960.....	30,540	178,963	19,991	39,547	101,445	373,243	532,400	18,424	3.679	2,565
1961.....	31,635	192,320	20,301	40,301	105,951	388,190	548,283	17,698	3.664	2,629
1962.....	32,870	205,336	21,814	43,923	117,850	414,800	593,261	16,293	3.520	2,683
1963.....	32,990	214,597	22,772	44,898	125,418	450,507	648,683	15,419	3.592	2,793
1964.....	34,901	235,210	24,155	47,982	139,185	502,753	732,465	19,417	3.612	2,901
1965.....	39,370	268,811	26,834	55,510	162,565	582,634	846,326	22,553	3.584	2,929
1966.....	45,888	325,076	31,519	66,006	195,668	718,518	1,049,017	31,890	3.672	2,964
1967.....	¹ 47,600	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,135,000	N.A.	N.A.	N.A.
1968.....	¹ 46,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,128,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Industrial Controls—SIC 3622**

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$19	N.A.	\$447	4	(2)
1959.....	20	N.A.	516	4	(2)
1960.....	20	N.A.	567	4	(2)
1961.....	28	N.A.	543	5	(2)
1962.....	28	N.A.	578	5	(2)
1963.....	38	N.A.	633	6	(2)
1964.....	31	N.A.	766	4	(2)
1965.....	39	N.A.	871	5	(2)
1966.....	40	N.A.	³ 1,002	4	(2)
1967.....	41	N.A.	³ 1,100	³ 4	(2)
1968.....	43	N.A.	³ 1,075	³ 4	(2)

¹ New supply consists of shipments plus imports.

² Import data are not available; however, it is estimated that imports amount to less than 2 percent of new supply.

³ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Industrial Controls—SIC 3622**

United States buys from—	United States sells to—
Canada Japan EEC	Canada United Kingdom Netherlands Mexico Italy Philippines Japan France West Germany

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Industrial Controls—SIC 3622

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	216	27, 150	\$413	141	867	\$15	41	2, 016	\$33	34	24, 267	\$365
1963.....	427	32, 990	649	309	1, 743	33	81	3, 713	70	37	27, 534	546

Source: Bureau of the Census.

Table 5.—Key Ratios
Industrial Controls—SIC 3622

Item	1963
Investment per production worker.....	\$8, 302
Specialization ratio (%).....	79
Concentration ratios (%):	
4 firms.....	56
8 firms.....	69
20 firms.....	81
50 firms.....	90

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3622.

Table 6.—Geographic Distribution, 1963
Industrial Controls—SIC 3622

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	32, 990	East North Central.....	20, 599
New England.....	1, 997	Illinois.....	3, 386
Massachusetts.....	993	Wisconsin.....	12, 635
Connecticut.....	994	Ohio.....	2, 432
Middle Atlantic.....	2, 943	West North Central.....	983
New York.....	1, 775	South.....	5, 251
New Jersey.....	523	West.....	1, 217
Pennsylvania.....	645	California.....	1, 005

Source: Bureau of the Census.

Industrial Trucks and Tractors

SIC 3537

Industrial Trucks and Tractors is the fastest growing member of the materials handling equipment family of four industries: (1) Elevators and Moving Stairways; (2) Conveyors; (3) Cranes and Hoists; and (4) Industrial Trucks and Tractors. Between 1958 and 1968, the value of shipments of the truck and tractor industry grew from \$269 million to an estimated \$896 million—a threefold increase. In 1958, the industry was responsible for one-quarter of the total dollar value of shipments of materials handling equipment. In 1966, the industry's share had risen to 34 percent.

Industrial trucks and tractors, including lift trucks, truck cranes, and power stackers, play a vital role in the manufacturing process, since they involve movement of materials to a point where finished goods are produced, and subsequently, to a point from which distribution is made to the ultimate consumer. All stages of production movement require some form of materials handling equipment.

The industry is largely concentrated in New York and Pennsylvania, in Illinois, Michigan, and Ohio, in Oregon and California. It is a dynamic industry whose growth since 1958 can be traced to a number of factors.

GROWTH FACTORS

As manufacturing has grown significantly since 1958, producers have sought ways of reducing costs of handling, storing and distributing material and products. The industry has been particularly alert to the widely varying needs of its customers, and has not only designed equipment to meet user needs, but has also made significant progress in the area of systems analysis. This activity complements the production process, since it is designed to produce, for any one customer, the most effec-

tive mix of materials handling equipment for the customer's operation.

Producers of industrial trucks and tractors are constantly striving to improve and upgrade their products. New, improved designs are introduced yearly, offering the benefits of greater load capability in a smaller package, increased mobility and speed of equipment, as well as improved operator controls and reliability with lower maintenance costs.

The growth of the industry has not been significantly influenced by markets abroad. Exports have been 8 to 12 percent of the value of domestic shipments. Some companies producing this equipment have, however, opened plants abroad and have successfully competed in foreign markets using foreign labor.

Growth has come about principally because of the constant battle to offset rising costs. Industrial trucks and tractors raise productivity, in that mechanical power is substituted for manpower.

Simpler, more responsive equipment controls encourage, in addition, the use of less skilled and less expensive manpower in the movement of materials and goods.

A further factor which has assisted the industry's success is fast equipment maintenance. Marketing of the equipment is primarily through specialized distributors whose organizations are highly trained in industrial-commercial operations and in high standards of equipment maintenance. This feature is important to industrial operations, which cannot afford frequent and costly work stoppage due to inferior or poorly maintained materials handling equipment.

Finally, the high degree of competitiveness of the industry is reflected in prices, as well as quality of product and service.

FUTURE PROSPECTS

Production of industrial trucks and tractors will continue to grow as industry grows and as pressures increase for cost-reduction devices. There will be many changes in new equipment. Some operations which have been handled by lift trucks will, in the interest of efficiency, use automated conveyor or overhead stacker crane equipment. New and large-capacity lift trucks may, in some applications, replace cranes. Internal combustion engine powered equipment used in warehouse work is likely to be replaced by smaller electric power units with improved operator controls.

Competition within the industry will become more intense. Product lines will be broadened. New equipment producers will enter the field. There is and will be no dearth of new ideas.

Exports will probably not increase greatly since U.S. companies will continue to sell U.S. designs in foreign markets through plants built abroad. Competition from imports, which is negligible today, will become a factor. Aggressive foreign firms will seek to attract U.S. customers with lower prices for well-designed equipment. Japan is now in the forefront of this movement.

U.S. manufacturers of industrial trucks and tractors will endeavor to strengthen existing services to U.S. industry through industry expansion and addition of auxiliary equipment to product lines. A major expansion in systems engineering services is foreseen, as emphasis is placed on the need for providing the customer-user with an integrated materials handling system, with industrial trucks and tractors playing an increasingly important role.

**Table 1.—General Statistics
Industrial Trucks and Tractors—SIC 3537**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	14,786	76,200	9,545	18,121	42,982	117,500	269,328	3,344	2.734	2.372
1959.....	15,274	88,369	10,012	21,095	52,056	170,410	333,196	4,299	3.274	2.468
1960.....	17,473	100,683	11,569	24,147	59,514	169,279	366,043	5,981	2.844	2.465
1961.....	15,670	90,827	9,873	20,320	49,874	144,832	319,449	N.A.	2.904	2.454
1962.....	16,473	100,374	10,837	22,223	58,113	175,410	360,562	4,134	3.018	2.615
1963.....	17,570	110,444	11,454	23,815	64,476	233,116	446,957	6,696	3.616	2.707
1964.....	19,915	130,781	14,990	28,071	76,197	274,550	532,960	9,415	3.603	2.714
1965.....	21,482	152,608	14,194	31,022	92,254	321,249	627,727	11,640	3.482	2.974
1966.....	26,297	189,947	17,822	37,894	116,837	404,900	792,088	18,436	3.466	3.083
1967.....	¹ 26,600	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 844,000	N.A.	N.A.	N.A.
1968.....	¹ 27,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 896,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A. = Not available.
Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Industrial Trucks and Tractors—SIC 3537**

(Dollars in millions)

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$32.9	N.A.	\$277	11.9	N.A.
1959.....	34.8	N.A.	375	9.3	N.A.
1960.....	40.7	N.A.	389	10.5	N.A.
1961.....	39.4	N.A.	346	11.4	N.A.
1962.....	40.1	N.A.	394	10.2	N.A.
1963.....	45.0	N.A.	459	9.8	N.A.
1964.....	55.1	\$1.6	563	9.8	.3
1965.....	65.9	.7	637	10.3	.1
1966.....	68.1	2.1	768	8.8	.3
1967.....	73.1	3.3	N.A.	N.A.	N.A.
1968.....	² 75.7	² 5.0	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Estimated.

N.A. = Not available.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Industrial Trucks and Tractors—SIC 3537**

United States buys from— ¹	United States sells to— ¹
Japan Canada United Kingdom Belgium West Germany	Canada Australia England Mexico Netherlands Belgium

¹ In order of importance.

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishments
Industrial Trucks and Tractors—SIC 3537**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	262	14,786	\$269	166	957	\$16	70	2,899	\$49	26	10,930	\$204
1963.....	314	17,570	447	206	1,325	27	82	3,690	78	26	12,555	342

Source: Bureau of the Census.

**Table 5.—Key Ratios
Industrial Trucks and Tractors—SIC 3537**

Item	1958	1963
Investment per employee.....	¹ \$5,556	\$10,415
Specialization ratio (%).....	92	90
Concentration ratios (%);		
4 firms.....	52	54
8 firms.....	64	64
20 firms.....	77	77
50 firms.....	88	88

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Industrial Trucks and Tractors—SIC 3537**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	17,570	South Atlantic.....	497
New England.....	890	Georgia.....	214
Middle Atlantic.....	3,857	East South Central.....	740
New York.....	767	Tennessee.....	336
New Jersey.....	121	West South Central.....	461
Pennsylvania.....	2,969	Texas.....	412
East North Central.....	8,113	West.....	2,396
Indiana.....	112	Pacific.....	
Illinois.....	2,406	Oregon.....	1,300
Michigan.....	2,183	California.....	1,044
Wisconsin.....	267		
Ohio.....	3,145		
West North Central.....	616		
Minnesota.....	255		
Iowa.....	166		

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3537.

Jewelry, Precious Metal, SIC 3911

The precious metal jewelry industry is marked by steady growth. In an industry consisting of numerous small firms—(over 80 percent of the plants have fewer than 20 employees), employment rose in excess of 45 percent between 1958 and 1968. The value of shipments surged upward 148 percent, while capital expenditures climbed by more than 50 percent.

GROWTH FACTORS

Sales of the precious metal jewelry, products generally considered luxury items, are largely dependent on availability of disposable income. The rise in personal income in the past decade has been the greatest single factor contributing to the industry's growth.

Removal of the Federal excise tax on jewelry in 1965 also supplied a real impetus to sales. Affluence has not only enhanced turnover of merchandise, but it has triggered upgrading in the quality of purchases. Growth in the size of the middle income group has produced an expanding market with an awareness of, and a desire to purchase quality merchandise.

Since 1958 year-to-year increases in the number of marriages and school graduations, combined with increasing use of jewelry by companies, lodges and fraternal organizations, have fueled the industry's market expansion. The number of marriages in 1967 exceeded that in 1958 by 28 percent as a result of a gradual lowering over the years of the median age of marriage and a growing

number of young people marrying before they are 20.

Moreover, between 1961 and 1966 the number of high school graduations and bachelor degrees conferred each rose by over one-third.

The increase in expenditures by the teenaged population has also had an impact on the precious metal jewelry industry's growth. Their spendable funds have soared, due to increases in allowances and increases in the number of teenagers who hold summer jobs and part-time jobs during the school year. The most important items in the teenage market are earrings for pierced ears, which have become popular in the past five years.

FUTURE PROSPECTS

Although precious metal jewelry is not a necessity and its purchase by consumers depends largely on income levels, still tradition provides a basic level of demand. The traditional events such as, weddings, graduations, special achievements will continue to be expansive and stable forces in the jewelry market. This, coupled with expected gains in disposable personal income, should bolster annual sales for the industry in the near future.

Increases in personal income and in the size of the age group between 14 and 34 will have significant impacts on all consumer spending, including that for precious metal jewelry. It is estimated that by 1985, nearly two-thirds of all families will have incomes of \$10,000 or more, and that the age group between 14 and 34 will have increased by 25 percent.

Table 1.—General Statistics
Jewelry, Precious Metal—SIC 3911

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital ex- penditures (\$1,000)	Value added per dollar of wages (dollars)	Wages per production worker man-hour (dollars)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	21,196	95,134	15,924	30,749	60,726	166,579	327,251	3,461	2.743	1.975
1959.....	20,596	99,136	15,510	32,137	64,107	174,567	348,324	N.A.	2.723	1.995
1960.....	20,775	102,578	15,459	32,476	65,456	188,953	362,719	2,424	2.887	2.016
1961.....	21,384	106,495	15,753	33,392	67,824	189,561	386,492	2,384	2.795	2.031
1962.....	21,740	112,888	16,092	34,617	72,533	203,942	411,367	1,764	2.812	2.095
1963.....	23,551	125,610	17,455	35,601	79,251	234,925	481,943	3,676	2.964	2.226
1964.....	24,072	134,334	17,511	36,012	83,600	240,045	508,590	3,482	2.871	2.321
1965.....	28,433	160,296	21,595	45,049	103,266	314,146	620,502	3,924	3.042	2.292
1966.....	29,329	161,263	22,207	44,296	94,900	327,853	693,810	5,152	3.455	2.142
1967.....	¹ 30,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 750,000	N.A.	N.A.	N.A.
1968.....	¹ 30,750	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 810,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3911.

Table 4.—Number of Employees by Size of Establishment
Jewelry, Precious Metal—SIC 3911
[Dollars in millions]

Year	Total			1-19			20-99			100 and Over		
	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments	Establish- ments	Employees	Shipments
1958.....	1,302	21,010	326	1,119	5,422	102	152	6,366	90	31	9,222	134
1963.....	1,438	23,551	482	1,220	5,840	123	183	7,645	149	35	10,066	209

Source: Bureau of the Census.

Table 5.—Key Ratios
Jewelry, Precious Metal—SIC 3911

Item	1958	1963
Investment per production worker.....	N.A.	2,743
Specialization ratio (%).....	95	92
Concentration ratios:		
4 firms.....	18	26
8 firms.....	25	33
20 firms.....	36	42
50 firms.....	48	53

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Jewelry, Precious Metal—SIC 3911

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	23,551	East North Central.....	1,941
New England.....	7,596	Illinois.....	475
Massachusetts.....	3,949	Michigan.....	356
Rhode Island.....	3,610	Ohio.....	293
Middle Atlantic.....	11,184	West North Central.....	857
New York.....	8,288	South Atlantic.....	134
New Jersey.....	2,511	East South Central.....	139
Pennsylvania.....	385	West South Central.....	368
		Mountain.....	463
		Pacific.....	869
		California.....	712

Source: Bureau of the Census.

Table 7.—Principal Products
Jewelry, Precious Metal—SIC 3911
[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Jewelry, made of platinum metals and carat gold.....	195	202	204	215	229	286	314	394	419	2.15
Jewelry, made of precious metals, except platinum and carat gold.....	74	78	82	86	92	94	87	132	149	2.01
Jewelry, precious metal, N.S.K.....	18	*16	*17	*17	*20	20	24	*12	*11	N.C.

N.C.=Not computed.
N.S.K.=Not specified by kind.

Source: Bureau of the Census.

*Standard error of estimate of 15 percent or more.

KNIT FABRICS

SIC 2256

The knit fabric industry has shown an outstanding rate of growth among fabric manufacturing industries. The value of shipments increased 135 percent to \$1,144 million between 1958 and 1966, while wholesale prices for these fabrics declined slightly. Total employment showed a 75-percent gain from 18,400 in 1958 to 32,000 in 1966.

GROWTH FACTORS

Once limited largely to an undergarment and sweater material, knits are now launching a full-scale invasion of the outerwear world. The appearance of wool double-knits and man-made fibers knits has been largely responsible for this upsurge in demand.

Wool double-knits are being used extensively to manufacture women's dresses, suits, coats, and sportswear. They offer the advantages of draping well, holding their shape and being relatively easy to care for. Recently developed machine-washable wool double-knit fabrics will provide further convenience to consumers.

Consumer demand for textile products with easy care characteristics has stimulated the use of knit fabrics because these fabrics are resistant to wrinkling and require little or no ironing. Easy care properties of man-made fiber knit fabrics may be further improved through the use of durable press finishes.

The ability of knitters to texture fabrics into an almost limitless variety of surface effects is particularly important in helping designers create the new and unusual fabrics so much in demand for today's high fashion apparel. The new man-made fiber knits add further versatility to knit fabrics since they can be made to look and feel

like other types of fabrics such as wool, silk, or crepe.

The recent development of bonding processes has boosted the demand for cotton and man-made fiber knits. Nylon tricot is the most popular fabric used for bonding. The bond of tricot to a loose-weave wool, for example, strengthens the wool to prevent stretching and bagging and completely arrests raveling.

From the manufacturer's point of view, knits offer a basic advantage over woven fabrics—flexibility. Knitting machines require less time to set up than weaving machines and less output is necessary to make each machine-run economical. The knit fabric manufacturer can change the color, fiber content, and texture of his fabrics quickly enough to keep up with fast-paced changes in fashion.

U.S. imports of knit fabrics expanded substantially from \$1.3 million in 1958 to \$13.4 million in 1967, an increase of 930 percent. Recent growth has occurred primarily in knit fabrics of wool and man-made fibers. In 1967, wool knit fabric imports accounted for \$5.1 million of the total; man-made fiber, \$7.4 million; cotton, \$0.7 million and other miscellaneous fibers, \$0.2 million. The United Kingdom, Italy, West Germany, Canada, and Japan are the most important suppliers of imported knit fabrics.

In assessing the impact of imports on the knit fabric industry, it is necessary to consider the indirect impact of knit apparel imports as well as the direct impact of knit fabric imports since imported knit apparel displaces both domestically produced apparel and the fabric which would be needed to make this apparel. Imports of knit apparel have expanded sharply. Imported goods currently account for a significant share of

domestic consumption of numerous knit apparel items. For example, 25 percent of domestic consumption of wool knit outerwear and nearly 40 percent of domestic consumption of men's and boys' man-made fiber knit shirts are accounted for by imported items.

U.S. exports of knit fabric increased from \$10.5 million in 1958 to \$21.7 million in 1967 or 107 percent. Throughout this period, Canada and the Republic of South Africa have been our largest oversea markets. The eight countries listed in table 3 accounted for nearly 80 percent of our knit fabric exports in 1967 and have consistently taken the bulk of these fabrics. U.S. exports of knit fabrics are handicapped by the foreign trade restrictions imposed by many countries.

FUTURE PROSPECTS

The knit fabric industry's maintenance of its position as one of the growth leaders among textile producers will depend on its abilities to develop new products and to penetrate further markets that have been traditionally the domain of weavers.

Men's wear is an area in which knitters expect to make significant inroads in the near future. Until recently, knit fabrics were used mostly to manufacture underwear, sport shirts, sweaters, and sleepwear. Knitters are improving fabrics and undertaking energetic promotional efforts to build a market for their fabrics in the jacket, trouser, suit, and sport coat areas of men's garment manufacturing.

New styles of furniture will also have an impact on the knitting industry. Knitters have recently developed upholstery fabrics that are particularly adaptable to the new molded furniture appearing in this country and abroad. The stretchability of knits is essential to shaping the fabric to the lines of molded furniture pieces.

The current popularity of knitted fabrics indicates that the industry is in a good position to foresee more expansion as a result of growth in the economy as a whole. It is estimated that by 1985, more than 60 percent of the families in the United States will have incomes of \$10,000 or more per year. In contrast, about 30 percent of all families were in that income bracket in 1966. Increased family incomes will bring about increases in discretionary spending power—spending power that can be used to keep pace with changes in fashion.

The size of the primary clothes-buying age group (15 to 29 years) will increase by about 45 percent between 1966 and 1985. The adaptability of knits to quick changes in fashions should bolster their sales growth to garment manufacturers who cater to this style conscious young adult sector of the population.

All of the foregoing factors indicate that the domestic market for knit fabrics should continue to expand. However, imports of both knit fabrics and knit apparel are increasing very rapidly, and their adverse impact on domestic producers must be considered in assessing the knit fabric industry's future prospects.

**Table 1.—General Statistics
Knit Fabric Mills—SIC 2256**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	18,356	73,871	15,689	32,301	55,693	147,394	487,185	7,132	2.647	1.72 ⁴
1959.....	19,426	82,332	16,846	35,827	62,426	180,299	536,468	9,772	2.888	1.742
1960.....	19,278	83,757	16,464	34,622	62,502	168,659	553,519	8,653	2.698	1.805
1961.....	20,380	92,159	17,463	37,167	68,165	191,670	626,062	12,545	2.812	1.834
1962.....	20,469	97,750	17,546	37,932	71,656	204,488	655,508	16,338	2.854	1.889
1963.....	25,046	117,532	21,364	46,465	88,296	252,908	817,383	18,409	2.864	1.900
1964.....	26,859	130,130	22,859	49,771	97,194	280,649	902,335	25,287	2.888	1.953
1965.....	28,282	140,190	23,938	51,641	102,779	333,335	1,017,325	28,187	3.243	1.990
1966.....	31,987	164,260	27,064	58,272	119,247	396,109	1,143,618	59,519	3.322	2.046
1967.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

N.A.=Not available.

Source: Bureau of the Census.

**Table 2.—Foreign Trade
Knit Fabrics—SIC 2256**

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$10.5	\$1.3	\$487.2	2.2	.3
1959.....	10.5	1.3	536.5	2.0	.2
1960.....	12.5	3.1	553.5	2.3	.6
1961.....	13.0	6.4	626.1	2.1	1.0
1962.....	11.8	8.7	655.5	1.8	1.3
1963.....	12.8	6.4	817.4	1.6	.8
1964.....	18.0	5.6	902.3	2.0	.6
1965.....	20.5	9.2	1,017.3	2.0	.9
1966.....	19.7	11.2	1,143.6	1.7	1.0
1967.....	21.7	² 13.4	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Preliminary.

N.A.=Not available.

Source: Bureau of the Census.

**Table 3.—Principal Trading Partners
Knit Fabrics—SIC 2256**

United States buys from—	United States sells to—
United Kingdom Italy West Germany Canada Japan	Canada South Africa United Kingdom Philippines West Germany Belgium Australia Sweden

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Knit Fabric Mills—SIC 2256**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	357	18,356	\$487	176	1,431	\$50	129	5,500	\$150	52	11,425	\$287
1963.....	518	25,046	817	275	1,999	95	178	8,225	304	65	14,822	419

Source: Bureau of the Census.

**Table 5.—Key Ratios
Knit Fabrics—SIC 2256**

Item	1958	1963
Investment per production worker.....	¹ \$6,157	\$7,365
Specialization ratio (%).....	94	95
Concentration ratios (%):		
4 firms.....	18	18
8 firms.....	30	25
20 firms.....	51	42
50 firms.....	72	65

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Knit Fabrics—SIC 2256**

Geographic area	All employees	Geographic area	All employees
Total.....	25,046	East North Central.....	539
New England.....	4,323	West North Central.....	119
Massachusetts.....	2,678	Minnesota.....	119
Connecticut.....	259	South Atlantic.....	7,513
Middle Atlantic.....	10,902	North Carolina.....	5,496
New York.....	5,357	South Carolina.....	711
New Jersey.....	1,731	East South Central.....	1,520
Pennsylvania.....	3,814	Pacific.....	130
		California.....	130

Source: Bureau of the Census.

**Table 7.—Principal Products
Knit Fabric Mills—SIC 2256**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Warp-knit fabrics.....	217	238	237	262	277	319	382	426	482	2.22
Circular knit fabrics.....	245	273	295	354	365	418	443	510	598	2.44
Knit fabrics mills, N.S.K.....	0	0	0	0	0	6	*18	6	11	N.C.

*Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.S.K.-Not Specified by kind.

Source: Bureau of the Census.

Manifold Business Forms

SIC 2761

A steady, robust annual increase in value of shipments, value added by manufacture, and productivity have characterized the manifold business forms industry for the past 10 years. Shipments grew 145 percent from 1958 through 1968 to an estimated \$966 million.

The industry is concentrated in highly industrialized areas such as the Middle Atlantic, East North Central States and in California. Four States, Ohio, California, New York, and Delaware, each accounted for over 10 percent of the total employment in this industry in 1963.

GROWTH FACTORS

The big story behind the growth of the business forms industry is the tremendous upsurge in the use of computers and other automated data processing equipment by both business and government. With a large portion of the forms manufactured being consumed as computer input and output, the tenfold increase in the number of computers installed between 1958 and 1967 has provided the industry its biggest boost. The use of automated data processing equipment is expected to grow at a rate equal to or even greater than it has in recent years.

The ever-increasing size and scope of local, State, and Federal government activities, with new programs, regulations, procurement, controls, and taxation, have resulted in greatly increased requirements for record keeping, not only by the business firm and the government organization, but also by the private citizen. This invariably has meant forms; records need to be uniform. Reporting requirements have also meant forms; data must be organized and transmitted in consistent form.

The growing complexity and size of most of business and all of government also generate increasing needs for improved internal control. Such improved controls also result in forms—forms which are usually designed by the business forms producers to become an integral part of such overall business systems as modern accounting, computing, bookkeeping, and other data processing machinery and equipment systems. As management becomes more sophisticated, it gets hungrier for more data—data which usually must be organized in some systematic manner that requires forms. The increase in mergers, especially conglomerates, has accentuated this process.

The growth in the use of credit cards has also been a major stimulator of the use of business forms. Every time a purchase is made with a credit card, forms are used.

Continued economic growth and population increase are also general factors which have contributed to the uninterrupted growth of this industry. The rise in the industry's output has generally kept pace, and in some years has moved ahead of the annual rate of increase in the gross national product.

Rising retail sales have also resulted in a correlated increase in the use of such forms as sales books and unit sets. Increased retail transactions have meant more customers receipts and more records for the retailer.

FUTURE PROSPECTS

Certain recent technological developments may have significant effects on the future growth of the forms industry.

Optical Character Recognition (OCR), one such technological breakthrough, holds great

potential for increasing the sales of forms manufactures. The optical scanner is an electronic reader capable of recognizing and translating printed words, letters, symbols, or hand written marks into machine-readable language with no intermediate processing of any kind. This would, of course, eliminate costly key punch operations. OCR is expected to create a demand for precision input forms, such as punch card sets manufactured for self-punch optical scanners.

In contrast, increased data transmission by electronic means (probably through the telephone or telegraph systems) will at some point in the future certainly divert business from the present forms markets, although it is, at present, impossible to predict the extent.

New techniques which allow computer output to be transferred directly to microfilm in the form of electronic impulses, may very well replace much of the present paper output of the computer.

Another source of market diversion may come in the form of a recently developed electrostatic

copier which can print a form background at the same time it prints the variable entries on the form. Automatic switching of form outlines, kept on sheets of film within the machine, is an important feature of this copier, which could lessen the use of applicable business forms.

However, even if some changes in technology result in a decrease in the amount of paper per transaction, the number of transactions will increase at such a rate that the total volume of forms used will continue to increase. Data processing in the Federal Government will continue to grow at a very high rate. The need for increased record keeping by State and municipal governments and by small- and medium-sized businesses will boost the use of data processing equipment, especially with the growth of the phenomenon of computer time sharing.

With the currently expected rates of growth in the economy and in the use of computers, industry sources look to at least a doubling in forms volume in the next 10 years.

**Table 1.—General Statistics
Manifold Business Forms—SIC 2761**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	23 618	120,945	16,883	32,823	79 623	245 229	405 731	14,755	3.080	2.426
1959.....	24 747	128,096	17,952	35 536	84 939	273,271	450,820	N.A.	3.217	2.390
1960.....	24 998	131,568	17,947	35,463	86 543	288 626	473,850	N.A.	3.335	2.440
1961.....	26,254	136,468	18,470	36 318	91 382	298,970	497,848	N.A.	3.272	2.516
1962.....	27,268	146,510	19,124	38,587	98 702	329 740	552 523	N.A.	3.341	2.558
1963.....	28,796	173,238	21,259	43,296	116,680	377 710	637,673	23 084	3.237	2.695
1964.....	28,822	177,824	21,494	44,794	120,745	401,251	679,563	22,152	3.323	2.696
1965.....	30,288	192,346	22,309	46,570	128,591	436,490	739,675	29,481	3.394	2.761
1966.....	31,635	208,283	23,125	48,516	140,343	486,350	823,873	44,436	3.465	2.893
1967.....	132,700	N.A.	N.A.	N.A.	N.A.	N.A.	1906,300	N.A.	N.A.	N.A.
1968.....	133,800	N.A.	N.A.	N.A.	N.A.	N.A.	1996,900	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 2761.

**Table 4.—Number of Employees by Size of Establishment
Manifold Business Forms—SIC 2761**

[Dollars in millions]

Year	Total			1-19			20-99			100 and Over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	704	23,618	\$406	539	2,841	\$42	110	4,847	\$82	55	15,930	\$281
1963.....	502	28,796	\$638	252	1,931	\$33	176	8,209	\$160	74	18,656	\$444

Source: Bureau of the Census.

Table 5.—Key Ratios
Manifold Business Forms—SIC 2761

Item	1958	1963
Investment per production worker.....	N.A.	\$9,850
Specialization ratio (%).....	N.A.	90
Concentration ratios (%):		
4 firms.....	N.A.	46
8 firms.....	N.A.	55
20 firms.....	N.A.	68
50 firms.....	N.A.	80

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Manifold Business Forms—SIC 2761

Geographic area	All employees	Geographic area	All employees
Total.....	28,796	West North Central—Con.	
New England.....	1,655	Missouri.....	846
Massachusetts.....	777	Kansas.....	429
Connecticut.....	528	South Atlantic.....	2,599
Middle Atlantic.....	5,935	North Carolina.....	451
New York.....	3,372	Georgia.....	302
New Jersey.....	1,104	Florida.....	374
Pennsylvania.....	1,459	East South Central.....	761
East North Central.....	9,110	Tennessee.....	238
Indiana.....	618	Alabama.....	258
Illinois.....	3,331	West South Central.....	2,507
Michigan.....	784	Texas.....	1,994
Wisconsin.....	331	Mountain.....	182
Ohio.....	4,046	Pacific.....	4,209
West North Central.....	1,838	Washington.....	162
Minnesota.....	257	Oregon.....	271
Iowa.....	264	California.....	3,776

Source: Bureau of the Census.

Table 7.—Principal Products
Manifold Business Forms—SIC 2761

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Continuous business forms.....	169	189	207	223	247	291	320	357	407	2.40
Unit set forms.....	160	173	173	196	205	258	262	285	324	2.03
Sales and other manifold books.....	45	49	51	49	50	40	40	58	61	1.35
Manifold business forms, N.S.K.....	N.A.	N.A.	N.A.	N.A.	N.A.	10	10	(2)	1	N.C.

¹ Standard error of estimate of 15 percent or more.

² Less than \$50,000.

N.A.=Not available.

N.C.=Not computed.

Source: Bureau of the Census.

Man-Made Fibers, Noncellulosic

SIC 2824

The noncellulosic man-made fiber industry is among the 15 fastest growing in the United States. Both value of shipments and employment more than tripled during the past decade. These fibers are manufactured primarily in Virginia, Tennessee, North Carolina, and South Carolina.

GROWTH FACTORS

Noncellulosic fibers have grown rapidly because they have helped to increase the total use of textile fibers and at the same time gained an increasing share of the total textile fiber market. Many factors ranging from improved fiber qualities to a long-term decline in prices, have combined to produce this growth.

In the field of fiber quality, noncellulosic fibers have great strength, resistance to abrasion and the effects of acids and weather, and the ability to impart crease retaining and wrinkle resisting qualities to articles made from them. No single fiber has all of these characteristics, but the industry has developed a wide variety of fiber types each having qualities particularly suited for specific end uses. The industry has also developed blends of two or more fibers, either entirely or partly cellulosic, that have qualities not available in any single fiber.

The combination of multiple fiber types, each with qualities adapted for specific end-uses backed by large-scale promotional activities, has made noncellulosic fibers popular with consumers. The growing popularity of polyester, acrylic, and, to a lesser extent, nylon fiber contributed to the rise in the use of noncellulosic man-made fibers in knit outerwear. The recent development of durable press treatments for both woven and knit fabrics, has resulted in a marked increase in the consump-

tion of these fibers, especially polyester, in apparel.

The tufted carpet and rug industry is the most important user of noncellulosic fibers among home furnishing industries. Whereas cotton and later rayon were once the most important tufted carpet and rug materials, more than two-thirds of all fibers used currently to make tufted carpets and rugs are noncellulosic man-made fibers. The easy-care features of noncellulosic man-made fiber carpets and rugs have resulted in widespread use of these floor coverings in both the residential and commercial fields. Kitchen, bathroom, and outdoor carpets are being added to traditional residential carpeting. In addition, contract carpeting in schools, hospitals, supermarkets, and office buildings is burgeoning.

The most important industrial application of noncellulosic man-made fibers is in manufacturing tire cord and cord fabric. The past decade's growth in noncellulosic tire cord and cord fabric, including nylon and polyester, has resulted partially from growth in the tire industry itself, but mostly from the substitution of nylon and polyester for rayon, a cellulosic man-made fiber.

The growth of noncellulosic fibers has been aided by the many advantages that these fibers offer to textile processors. These include price stability, continuous availability, standardized specifications, cleanliness, and little waste during manufacturing.

In many products, the growing acceptance of noncellulosic fibers has been the result of fiber qualities as these fibers are higher in price than cotton, the most used textile fiber. However, the price of noncellulosic fibers has declined steadily over the years as producers have improved manufacturing processes and increased their scale of operations. The decline in the price of noncellulosic

relative to the price of other textile fibers has enabled noncellulosics to penetrate markets from which they formerly were excluded.

Until recently some import and export classifications included both noncellulosic and cellulosic fibers. Therefore, data on noncellulosic fiber imports go back only to 1964 and export data to 1965. Although precise figures are missing, exports of noncellulosic fibers probably exceeded imports until some time in the early 1960's.

Large-scale production of noncellulosic fibers developed earlier in the United States than it did abroad, and domestic producers capitalized on their lead in manufacturing technology and economies of scale to build export sales. However, foreign production of noncellulosic fibers has increased rapidly. It appears that as the technological lead enjoyed by domestic producers declines, U.S. imports will increase. This expectation is borne out by the 1964-67 figures that show imports more than doubling in 3 years. While imports were only about 2 percent of new supply in 1967, a continuation of the recent rate of growth of noncellulosic fiber imports might create problems for domestic producers and restrict future growth of the industry.

Foreign trade in noncellulosic fibers is largely with other industrialized countries. Canada, Netherlands, and Switzerland are our largest export markets and France, Italy, and Japan the largest suppliers of imports.

FUTURE PROSPECTS

Prospects for the future growth of the noncellulosic fibers industry are bright. However, the extremely rapid growth of the past decade may slow somewhat. A substantial part of recent growth has come from the displacement of other fibers by noncellulosics. With noncellulosic fibers now accounting for nearly 30 percent of total mill consumption of fibers, future growth will, of necessity, depend less on displacement of other fibers than it has in the past. The expected increase in imports may also tend to slow the growth of the domestic industry.

New product development has been and will continue to be a basic factor in the growth of this industry. The fact that man-made fibers can be manufactured to meet the specifications of purchasers will stimulate their application in varied end-uses.

Growth in the economy as a whole will have a significant impact on the noncellulosic man-made fiber industry's outlook. The continued trend toward informal living that will accompany predicted increases in leisure time will create higher demand for the convenience features of noncellulosic man-made fiber products. Population growth, especially in the 15- to 29-year-age group, and rising per capita incomes should have a positive effect on demand for clothing and home furnishings.

**Table 1.—General Statistics
Organic Fibers, Noncellulosic—SIC 2824**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	18,684	102,742	12,899	26,025	61,864	439,638	688,365	53,659	7.11	2.38
1959.....	22,178	129,596	16,270	32,203	82,175	557,753	875,149	24,733	6.79	2.55
1960.....	23,429	141,783	17,012	33,571	88,599	549,631	868,281	48,122	5.20	2.63
1961.....	28,956	186,443	20,386	40,230	111,832	668,061	1,039,489	117,550	5.97	2.78
1962.....	31,833	214,361	23,257	46,473	131,369	793,155	1,192,051	118,351	6.04	2.83
1963.....	41,421	275,809	28,385	57,240	161,042	922,001	1,403,178	170,323	5.73	2.81
1964.....	44,318	304,636	30,722	62,323	180,579	1,043,091	1,580,621	163,583	5.78	2.90
1965.....	51,467	358,457	36,461	73,641	216,377	1,215,366	1,842,933	363,021	5.62	2.94
1966.....	59,111	421,290	40,638	80,746	245,991	1,301,525	1,991,826	384,745	5.29	3.05
1967.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

N.A. = Not available.

Source: Bureau of the Census

Table 2.—Foreign Trade
Organic Fibers, Noncellulosic—SIC 2824

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	N.A.	N.A.	\$ 688.4	N.A.	N.A.
1959.....	N.A.	N.A.	875.1	N.A.	N.A.
1960.....	N.A.	N.A.	868.3	N.A.	N.A.
1961.....	N.A.	N.A.	1,039.5	N.A.	N.A.
1962.....	N.A.	N.A.	1,192.1	N.A.	N.A.
1963.....	N.A.	N.A.	1,403.2	N.A.	N.A.
1964.....	N.A.	\$21.4	1,580.6	N.A.	1.3
1965.....	\$29.5	44.6	1,842.9	1.6	2.4
1966.....	38.9	43.5	1,991.8	2.0	2.1
1967.....	² 40.7	² 48.6	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Preliminary.

Source: Bureau of the Census.

Table 3.—Principal Trading Partners
Organic Fibers, Noncellulosic—SIC 2324

United States buys from—	United States sells to—
France	Canada
Italy	Netherlands
Japan	Switzerland
West Germany	Mexico
United Kingdom	Spain
	U.S.S.R.
	United Kingdom

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Organic Fibers, Noncellulosic—SIC 2824

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments
1958.....	14	18,684	\$ 688				4	(1)	(1)	10	18,684	\$ 688
1963.....	25	41,421	1,403	1	(1)	(1)	2	(1)	(1)	22	41,421	1,403

¹ Not available included in size group 100 and over.

Source: Bureau of the Census.

Table 5.—Key Ratios
Organic Fibers, Noncellulosic—SIC 2824

Item	1963
Investment per production worker.....	\$2,802
Specialization ratio (%).....	95
Concentration ratios (%):	
4 firms.....	94
8 firms.....	99
20 firms.....	100
50 firms.....	(1)

¹ Not applicable.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Organic Fibers, Noncellulosic—SIC 2824

Geographic area	All em-ployees	Geographic area	All em-ployees
Total.....	41,421	North Carolina.....	7,702
South.....	41,421	South Carolina.....	3,581
		All other States.....	30,138

Source: Bureau of the Census.

Table 7.—Principal Products
Synthetic Organic Fibers Except Cellulosic—SIC 2824

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966
Polyamide fibers, nylon, exchange monofilaments.....	N.A.	N.A.	N.A.	N.A.	782	896	994	1,079	1,115
Other noncellulosic synthetic organic fibers.....	N.A.	N.A.	N.A.	N.A.	391	472	579	753	824

N.A. = Not available.

Source: Bureau of the Census.

Meat Packing Plants

SIC 2011

Substantial increases in production and productivity delineate the growth pattern of the meat packing industry from 1958 to 1968. Through advanced technologies, the industry increased total value of shipments by 34 percent and dropped 20,000 production workers during the period, resulting in an estimated 54 percent rise in the value of shipments per production worker by 1968. The number of new establishments, capital expenditures, and manhours per production worker rose perceptibly through 1966.

The meat packing industry may be described as dynamic and transitional. The old methods of transportation, slaughter and processing have been giving way to advanced technologies. Since the mid 1950's, many of the giants of the industry which have historically operated only at or near terminal stockyards—Cleveland, Indianapolis, Chicago, Denver—have closed their older and outmoded terminal packing plants and replaced them with new and modern slaughtering plants in livestock producing areas.

GROWTH FACTORS

New plant growth since the mid 1950's has been strongly influenced by independent packers who have built smaller, highly automated plants in rural areas which are close to the supply of animals and adequate supply of labor. Nearly a billion dollars have been invested in plant and equipment since 1958.

Not only has the industry changed in location, the technology of animal slaughter and meat processing has also changed. Most slaughter now is highly automated. The animal is suspended from the rail after felling. Mechanical hide pullers, power knives, conveyors, and automated machin-

ery assist in swift processing. These innovations have greatly increased the speed and efficiency of slaughter and processing operations, which have significantly raised the rate of employee output, and as a consequence, reduced labor requirements.

A combination of factors has been largely responsible for the growth of the industry. The increased per capita consumption of meats, primarily beef—per capita consumption of pork, lamb, and mutton declined during this decade—multiplied by the expanding population and steadily rising personal disposable income since 1958 is the basis for this growth.

Several other factors of a technological and institutional nature have contributed to the enlarged demand for beef. These include larger refrigerators and expanded use of freezers in the home, increased supermarket retailing, self-service displays of wider variety and newly introduced cuts of meat, more advertising and promotion, and better quality of meat produced.

FUTURE PROSPECTS

The industry is confident that the trend in the future is upward. The factors which influence this optimistic outlook are twofold; the growing population, and hence, a growing consumer market; rising incomes and the increasing preference for meat in the family diet. This preference is chiefly for beef rather than the other meats. Per capita consumption of meat, civilian and military, has risen 15 pounds during the past decade and may be expected to continue to increase along with a rising standard of living.

An important factor in the future growth of the meat packing industry is the availability of livestock—cattle, sheep and pigs. Production of

quality beef animals has become a highly specialized industry as a result of consumer demand. Increased emphasis on quality has led packers to demand a more uniform, higher quality animal, while narrow profit margins in the packing industry have pressured packers to utilize their plants more efficiently. Larger supplies of livestock have been coming from commercial feedlots which can usually produce high-quality meat animals on a year-round basis less expensively than can the small farmer. Commercial feeding

has been growing rapidly and, by all indications, will continue to increase as the meat packing industry demands a greater supply.

Exports of meat have not been of any great importance to the industry. However, the foreign market is now being cultivated by marketing organizations, which will attempt to acclimate foreign tastes to U.S. meat products. Rising incomes in Europe and a worldwide protein shortage may increase U.S. exports of meat products in the future.

**Table 1.—General Statistics
Meat Packing Plants—SIC 2011**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	201,019	1,068,766	150,936	309,314	768,616	1,749,291	11,972,464	65,860	2.276	2.485
1959.....	197,342	1,102,039	149,669	312,744	797,792	1,834,004	11,810,356	67,538	2.299	2.551
1960.....	194,296	1,139,550	147,797	312,888	827,063	1,911,776	11,828,339	77,233	2.312	2.643
1961.....	189,351	1,144,248	143,473	303,047	828,406	1,890,265	11,938,722	75,530	2.282	2.734
1962.....	185,715	1,161,962	141,723	298,177	845,453	1,987,049	12,491,425	90,920	2.350	2.835
1963.....	180,873	1,146,947	138,356	289,294	847,025	1,908,309	12,435,454	80,235	2.253	2.928
1964.....	182,661	1,226,460	138,613	310,131	902,503	2,127,862	12,973,338	94,743	2.358	2.910
1965.....	180,292	1,214,043	137,243	286,777	885,786	2,059,764	13,931,487	101,090	2.325	3.089
1966.....	173,984	1,211,900	132,438	279,221	883,752	2,025,456	15,068,932	104,261	2.292	3.165
1967.....	¹ 173,800	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 15,280,000	N.A.	N.A.	N.A.
1968.....	¹ 172,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 16,000,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 2011.

**Table 4.—Number of Employees by Size of Establishments
Meat Packing Plants—SIC 2011**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	2,801	200,783	\$11,962	1,824	9,971	\$528	668	29,023	\$2,160	309	161,789	\$9,274
1963.....	2,992	180,873	12,435	2,016	9,934	577	677	29,181	2,556	299	141,758	9,303

Source: Bureau of the Census.

**Table 5.—Key Ratios
Meat Packing Plants—SIC 2011**

Item	1958	1963
Investment per employee.....	¹ \$7,331	\$8,023
Specialization ratio (%).....	98	98
Concentration ratios (%):		
4 firms.....	34	31
8 firms.....	46	42
20 firms.....	57	54
50 firms.....	65	64

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Meat Packing Plants—SIC 2011

Geographic area	All employees	Geographic area	All employees
Total.....	180,873	South Atlantic—Con.	
New England.....	1,233	South Carolina.....	1,438
Massachusetts.....	338	Georgia.....	3,184
Connecticut.....	593	Florida.....	1,934
Middle Atlantic.....	14,562	East South Central.....	11,537
New York.....	4,078	Kentucky.....	2,673
New Jersey.....	3,001	Tennessee.....	4,629
Pennsylvania.....	7,483	Alabama.....	2,095
East North Central.....	36,104	Mississippi.....	2,140
Indiana.....	7,591	West South Central.....	14,433
Illinois.....	9,907	Arkansas.....	1,093
Michigan.....	2,678	Louisiana.....	973
Wisconsin.....	6,759	Oklahoma.....	2,325
Ohio.....	9,169	Texas.....	10,042
West North Central.....	67,929	Mountain.....	8,423
Minnesota.....	13,496	Montana.....	724
Iowa.....	23,630	Idaho.....	787
Missouri.....	7,652	Colorado.....	3,995
Nebraska.....	10,265	New Mexico.....	613
Kansas.....	8,070	Arizona.....	766
South Atlantic.....	15,564	Utah.....	1,265
Maryland.....	2,373	Pacific.....	11,088
Virginia.....	3,868	Washington.....	2,348
West Virginia.....	689	Oregon.....	1,346
North Carolina.....	2,027	California.....	7,135
		Hawaii.....	259

Source: Bureau of the Census.

Table 7.—Principal Products
Meat Packing Plants—SIC 2011

[Shipment value in 1,000]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Beef, fresh and frozen.....	5,019	5,355	5,396	5,337	5,717	5,708	6,018	6,429	6,899	1.37
Veal, fresh and frozen.....	414	374	351	328	344	311	305	327	333	.80
Lamb and mutton, fresh and frozen.....	305	308	296	287	291	300	298	308	335	1.10
Pork, fresh and frozen.....	2,124	2,056	2,074	2,177	2,240	2,203	2,346	2,505	2,800	1.32
Lard.....	332	281	274	288	257	224	237	255	227	.68
Hides, skins, and pelts.....	196	1366	1340	1356	1368	223	218	275	380	1.94
Other meat packing products, excluding sausage casings, N.E.C. or N.S.K.....	275	251	203	259	262	292	331	298	325	N.C.
Processed pork.....	1,822	1,695	1,606	1,634	1,621	1,635	1,675	1,800	1,937	1.06
Canned meats.....	599	631	633	695	724	730	814	768	812	1.36
Sausage.....	1,526	1,501	1,510	1,585	1,634	1,756	1,852	1,984	2,296	1.50

¹ Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.E.C.=Not elsewhere classified.

N.S.K.=Not specified by kind.

Source: U.S. Bureau of the Census.

Mechanical Measuring Devices

SIC 3821

Technological developments and aggressive sales campaigning have led to a 7.2 percent annual growth rate in mechanical measuring devices since 1958. Reflecting rising productivity, employment has increased only 3.2 percent annually in this period. The mechanical measurement device industry generally employs a number of highly skilled and technically oriented personnel as shown by wage and salary figures. Most production is located in Massachusetts, Pennsylvania, Illinois and Ohio.

GROWTH FACTORS

The major growth factor in this industry is the development of new and better products. Indeed, half of the measuring and controlling devices on the market today did not exist 10 years ago, and many of the old line instruments have been improved considerably.

Changing techniques have been applied to new measuring and controlling principles. These have extended the range, reliability, precision, and applicability of instrumentation. A particularly important advance in instrumentation has been the continuous measurement of solids suspended in liquids. This has made possible the extension of automatic measurement and control techniques to intermittent manufacturing processes.

With the advent of computer technology and its emphases on automation, industrial process instrument manufacturers have been prompted to provide complete integrated instrument systems. Requirements for instrumentation are particularly heavy in the capital intensive petroleum, chemical, pulp and paper, food processing, power generation, and primary metals industries.

The systems approach is now estimated to account for over 25 percent of new projects. Future turn key programs are soon expected to take 50 percent of new contracts. Nuclear process control instruments should assume a 10 to 15 percent share of this market in the future. Integration of nuclear and electronic systems is responsible for the development of more sophisticated product lines in several companies. Pneumatic systems incorporating fluidics are becoming more prevalent in processes in which there is one medium where extremely fast response is not a requirement.

Product development in nonelectrical integrating meters, motor vehicle instruments, aircraft engine instruments and in other mechanical measuring and controlling instruments, although not static, has been slower paced than in industrial process instruments.

Process control instruments are playing a significant role in air and water pollution abatement programs. It is in these programs that process control instruments applied in manufacturing plants can solve the problem of waste disposal by controlling closed-loop systems that permit the reuse of wastes.

Water desalination projects and nuclear powered reactor plants for electricity generation have relied extensively on the ingenuity of process instrument engineers. The unique problems of each industrial process requiring more precise measurement and control have in fact, fostered new developments to that end.

Growth in military expenditures has been a contributing factor to the increased demand for aircraft engine instruments. In addition, more and more instruments and replacement parts are being added to aircraft engines.

Some instrument areas are not, however, reflecting very rapid growth trends. A downward trend in motor vehicle instrument sales has resulted from greater use of electrically actuated instruments and greater durability in pneumatic devices. Gas and water meters account for the largest share of integrating meter shipments and therefore follow the trend of construction outlays.

FUTURE PROSPECTS

Extensive plant building and modernization activities and the availability of improved control

techniques and equipment should stimulate sales growth of more than 10 percent annually in the next several years. Utilization of new technologies such as lasers in surveying instruments and fluidics in process instrumentation, will result in a flow of new products.

User industries will reap many benefits from advanced control equipment. The major benefits to be derived are greater ease and economy in switching production to different specifications, higher product quality, and more consistent output. The greatly expanded usage of the control computer will increase markets for sensors, control valves and actuators.

**Table 1.—General Statistics
Mechanical Measuring Devices—SIC 3821**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	50,049	258,488	32,123	62,982	144,873	457,126	726,823	18,215	3.155	2.300
1959.....	52,779	288,414	34,534	66,767	158,438	535,978	824,656	N.A.	3.383	2.373
1960.....	59,701	340,524	37,505	76,709	183,594	599,992	948,679	24,394	3.268	2.393
1961.....	60,067	340,262	37,047	73,904	176,707	591,017	965,369	25,069	3.345	2.391
1962.....	65,077	376,233	41,264	85,572	205,410	673,981	1,073,753	29,626	3.281	2.400
1963.....	62,353	388,874	40,383	81,510	222,826	732,529	1,143,416	30,914	3.287	2.734
1964.....	60,905	416,356	38,373	78,519	228,699	765,509	1,217,101	38,529	3.347	2.913
1965.....	68,236	472,275	43,373	83,206	259,530	944,220	1,450,791	48,774	3.638	3.119
1966.....	70,645	500,982	44,195	82,515	260,316	950,934	1,428,510	44,430	3.653	3.155
1967.....	¹ 70,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,535,000	N.A.	N.A.	N.A.
1968.....	¹ 68,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,460,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3821.

**Table 4.—Number of Employees by Size of Establishment
Mechanical Measuring Devices—SIC 3821**

[Dollars in millions]

Year	Total			1-19			20-99			100 and Over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	627	50,049	727	398	2,356	36	136	6,134	85	93	41,559	606
1963.....	670	62,353	1,143	412	2,228	40	155	6,865	119	103	53,260	984

Source: Bureau of the Census.

Table 5.—Key Ratios
Mechanical Measuring Devices—SIC 3821

Item	1958	1963
Investment per production worker.....	N.A.	\$8, 220
Specialization ratio (%).....	N.A.	90
Concentration ratios:		
4 firms.....	N.A.	22
8 firms.....	N.A.	36
20 firms.....	N.A.	61
50 firms.....	N.A.	81

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Mechanical Measuring Devices—SIC 3821

Geographic area	All employees	Geographic area	All employees
Total.....	62,353		
New England.....	14,642	West North Central.....	956
Middle Atlantic.....	20,770	Missouri.....	108
Pennsylvania.....	11,483	South and West.....	7,064
East North Central.....	18,921	Maryland.....	2,081
Illinois.....	6,737	Oklahoma.....	475
Ohio.....	4,927	Texas.....	483

Source: Bureau of the Census.

Table 7.—Principal Products
Mechanical Measuring Devices—SIC 3821

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Aircraft engine instruments, excluding flight.....	55	65	62	49	46	66	61	62	86	1.55
Integrating meters, nonelectrical type.....	119	155	147	140	154	164	165	183	213	1.79
Industrial process instruments.....	403	444	500	338	369	522	589	645	714	1.77
Motor vehicle instruments, excluding electric.....	71	87	91	87	101	96	108	131	102	1.44
Other mechanical measuring and controlling instruments.....	93	117	131	134	152	117	115	161	188	2.03
Mechanical measuring devices, N.S.K.....	19	17	23	15	20	18	*12	*13	*7	N.C.

N.C.=Not computed.

N.S.K. Not specified by kind.

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Metal-Cutting Machine Tools

SIC 3541

The metal-cutting machine tool industry, spurred by the huge demand for its products from domestic and foreign sources, expanded rapidly during the 1958-68 period. The number of establishments producing metal-cutting machine tools grew from 627 in 1958 to 801 in 1963. Employment increased more than 50 percent to about 83,000 by the end of 1968.

Overall shipments of the industry rose almost 200 percent, from \$680 million in 1958 to nearly \$2 billion in 1968. Industrial-type machine tools, the principal product of the industry, accounted for 72 percent of the total shipments of metal cutting machine tools. During the 1958-66 period their value increased over 184 percent, from \$422 million in 1958 to \$1.2 billion in 1966. Annual net new orders increased over 444 percent from \$300 million in 1958 to over \$1.6 billion in 1966.

The value of exports of metal-cutting machine tools (particularly technically advanced industrial types) increased more than 76 percent, from \$101 million in 1958 to \$177 million in 1966. Foreign manufacturers of standard and general purpose metal-cutting machine tools, benefiting from lower production costs and faster delivery times, increased their exports to the United States by 584 percent, from nearly \$18 million in 1958 to \$121 million in 1966.

Except for a few plants located in the South, Southwest, and in California, the metal-cutting machine tool industry is concentrated in the area east of the Mississippi and north of the Ohio Rivers. Major concentrations are in Ohio, Illinois, Michigan, Wisconsin, Rhode Island, Massachusetts, Connecticut, New York, Pennsylvania, and New Jersey. The majority of the establishments produce standard and general purpose metal-cutting machine tools other than industrial

type; approximately 50 percent of the 801 plants have less than 15 employees. Production of technically advanced and industrial-type machine tools is concentrated in 269 establishments with 20 or more employees. These plants account for most of the output and employment of the industry.

GROWTH FACTORS

After World War II, the metal-cutting machine tool industry accelerated research and development aimed at technological improvements in machine tools. Principal improvements in the industrial-type machines were automated operation, application of numerical control systems, electrical discharging machining, chemical machining, and the use of lasers as manufacturing tools. Other important refinements included copying control techniques, automatic operating cycle controls, indexing and transfer production machines or lines, material feeding equipment, and automatic assembly and processing equipment.

The advanced technology used by the metal-cutting machine tool industry in the production of quality machine tools gave industrial users in the United States the equipment needed for many improvements in production techniques, and placed the industry in a strong competitive position in foreign markets, particularly for machine tools required by the automotive industries in Europe and Japan.

Capital expenditures for industrial plant expansion and modernization by the metalworking industry, the principal user of metal-cutting machine tools, were at a low level in the middle and late fifties, and its equipment was inadequate for improved production techniques and cost-

cutting operations. A 1959 survey indicated that over 72 percent of the 2¼ million machine tools in use in U.S. industries were over 10 years old. A relatively high percentage of these machines were obsolete because of the advanced technology, greater productivity, and tolerance capability of the new machines developed by the metal-cutting machine tool industry. As late as 1963 a similar survey indicated that 64 percent of the machine tool inventory of U.S. industries remained in the overage category, with one in every 10 machines at least 20 years old. The metalworking industry was under increased pressure to modernize its equipment to offset rising production costs and remain in a competitive position.

During the 1955-60 period, the U.S. Armed Forces disposed of excess stocks of metal-cutting machine tools, and procurement of new machines for replacement and modernization by the military services was at a low ebb. Beginning in 1961, military demand for new metal-cutting machine tools required for production of almost all types of military hardware was stepped-up as weapons system procurement increased and Armed Forces mobilization accelerated. Military defense demand for metal-cutting machine tools continued throughout the 1961-66 period.

The 1962 investment tax credit and revision of depreciation allowances were major stimulants for industrial expansion and plant modernization, generating greatly increased investment for capital equipment in all sectors of the economy. New orders for metal-cutting machine tools increased rapidly, particularly during the 1963-66 period.

FUTURE PROSPECTS

The suspension of the investment tax credit on October 10, 1966, had an immediate effect on the expansion and modernization programs of the industrial economy, resulting in curtailment of capital investments, especially in the consumer goods industries. Shipments of metal-cutting machine tools exceeded net new orders for the first time since 1963, beginning in the fourth quarter of 1966 and continuing through the first 5 months of 1968. The reinstatement of the investment tax credit on March 10, 1967, has not yet reversed the downward trend in new orders. The order backlog of the metal-cutting machine tool industry has also been declining since 1967. A reversal of this unfavorable position of the industry is dependent on growth in the national economy, competitive pressures on manufacturing industries to modernize capital equipment, and the easing of credit.

U.S. machine tool builders have maintained their competitive position in foreign markets with high cost, technically advanced machine tools, which are in strong demand in all industrialized countries. But they are faced with advanced production technologies of foreign metal-cutting machine tool manufacturers. Exports of standard and general purpose machine tools are declining because of the higher cost of U.S. machine tools. Foreign manufacturers are making a concerted effort to gain the confidence of U.S. metal manufacturing and fabricating industries by offering technologically improved products through stronger sales organizations.

**Table 1.—General Statistics
Metal-Cutting Machine Tools—SIC 3541**

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	52,864	300,344	36,154	69,619	182,171	420,961	679,836	18,840	2.311	2.617
1959.....	52,797	329,497	35,436	72,165	201,991	505,433	753,784	22,152	2.502	2.799
1960.....	58,777	370,894	39,487	80,918	223,825	578,210	881,676	24,770	2.583	2.766
1961.....	54,901	352,976	36,373	72,714	201,457	550,119	828,413	18,668	2.731	2.771
1962.....	58,855	401,810	39,253	81,217	235,035	670,989	982,118	26,643	2.855	2.894
1963.....	61,058	438,222	41,008	86,486	272,243	699,341	1,060,818	28,837	2.569	3.148
1964.....	65,078	497,726	44,471	97,317	306,845	836,224	1,286,022	41,652	2.725	3.153
1965.....	70,827	564,968	48,745	108,105	353,678	993,561	1,524,402	53,704	2.809	3.272
1966.....	79,767	673,356	55,279	123,800	427,536	1,234,151	1,826,073	74,899	2.887	3.453
1967.....	¹ 83,000	¹ 723,000	N.A.	N.A.	N.A.	N.A.	¹ 1,966,000	N.A.	N.A.	N.A.
1968.....	¹ 83,000	¹ 755,000	N.A.	N.A.	N.A.	N.A.	¹ 1,935,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Metal-Cutting Machine Tools—SIC 3541

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$100.6	\$17.7	\$587	17.1	2.9
1959.....	82.3	23.8	649	12.7	3.5
1960.....	127.8	26.3	747	17.1	3.4
1961.....	191.6	22.7	720	26.6	3.1
1962.....	205.1	28.5	832	24.7	3.3
1963.....	144.9	33.4	925	15.7	3.5
1964.....	204.8	38.3	1,135	18.0	3.3
1965.....	191.6	58.9	1,386	13.8	4.1
1966.....	177.3	121.0	1,639	12.2	6.9
1967.....	199.6	174.5	N.A.	N.A.	N.A.
1968.....	² 214.0	² 183.0	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Metal-Cutting Machine Tools—SIC 3541

United States buys from—	United States sells to—
West Germany	Canada
United Kingdom	United Kingdom
Japan	Japan
Italy	Italy
Switzerland	India
Canada	France
France	Mexico
	West Germany

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Metal-Cutting Machine Tools—SIC 3541

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Employees	Shipments	Establish-ments	Employees	Shipments	Establish-ments	Employees	Shipments	Establish-ments	Employees	Shipments
1958.....	627	52,864	\$680	396	2,257	\$32	135	6,099	\$91	96	44,508	\$558
1963.....	801	61,058	1,061	532	3,172	51	174	7,334	136	95	50,552	873

Source: Bureau of the Census.

Table 5.—Key Ratios
Metal-Cutting Machine Tools—SIC 3541

Item	1958	1963
Investment per production worker.....	¹ \$8,760	\$12,943
Specialization ratio (%).....	82	81
Concentration ratios (%):		
4 firms.....	21	20
8 firms.....	32	32
20 firms.....	52	52
50 firms.....	74	74

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Metal-Cutting Machine Tools—SIC 3541

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	61,058	East North Central—Cont.	
New England.....	14,853	Michigan.....	7,978
Vermont.....	3,692	Wisconsin.....	5,199
Connecticut.....	4,326	Ohio.....	15,343
Middle Atlantic.....	7,106	West North Central.....	547
New York.....	5,045	Minnesota.....	158
New Jersey.....	532	South.....	463
Pennsylvania.....	1,529	Texas.....	204
East North Central.....	36,845	Mountain.....	54
Indiana.....	1,634	Pacific.....	1,190
Illinois.....	6,691	California.....	1,097

Source: Bureau of the Census.

Table 7.—Principal Products
Metal-Cutting Machine Tools—SIC 3541

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Boring machines.....	52	46	47	52	61	66	77	94	115	2.24
Drilling machines.....	30	33	39	37	53	55	73	85	111	3.78
Gear-cutting and finishing machines.....	23	25	34	36	36	41	48	57	60	2.64
Grinding and polishing machines (excluding gear tooth grinding, honing, lapping, polishing and buffing machines).....	89	94	117	121	128	144	184	223	245	2.74
Lathes, metal cutting.....	99	119	135	126	152	163	208	247	303	3.07
Milling machines.....	89	73	79	74	96	113	127	150	202	2.26
Other machine tools (including those designed for home, workshops, laboratories, etc.).....	98	130	143	134	152	152	196	266	320	3.26
Parts for metal cutting type machine tools sold separately and rebuilt machine tools.....	89	109	131	118	132	166	200	239	260	2.93
Metal-cutting machine tools, N.S.K.....	19	*20	*20	*22	*21	24	*23	25	*23	N.C.

N.C.=Not computed.

*Standard error of estimate of 15 percent or more.

N.S.K=Not specified by kind.

Source: Bureau of the Census.

Metal Office Furniture

SIC 2522

The growth in demand for metal office furniture has paralleled the recent rapid rise in new office construction and in numbers of white collar workers. Business and Government have overwhelmingly chosen metal furniture for original outfitting and replacement not only because of its durability and convenience, but also because of its generally modern and imaginative design.

Although the production of metal office furniture is concentrated in establishments with fewer than 100 employees, located primarily in those States near the Great Lakes, larger manufacturers with multiplant operations and nationwide distribution outlets are coming into prominence as the office furniture market expands. A measure of this expansion is the 200 percent growth in value of metal office furniture shipments during 1958-68.

GROWTH FACTORS

The growth in demand for metal office furniture is a function both of the need for furnishing new and old buildings and of the buyer's preference. The office—not the factory—is now the most common place of work for today's employee.

The technological revolution, automation, increased education and other factors have caused the number of white collar workers to increase 25 percent in 1958-68 to 34 million. Over the same period the total work force increased only 12 percent. New office construction had to increase to provide the space for additional white collar personnel. Estimates of annual dollar volume of new office construction in 1968 approximate \$3 billion, an increase of more than 50 percent over the 1958 rate. More offices and more office workers lead inevitably to the need for more office furniture.

But why 80 percent of those furnishings have in recent years been made of metal is not so obvious.

Prior to World War II, wood was used almost exclusively in office furniture. Only the metal file cabinet was able to penetrate the market. After the war, small firms began making desks and chairs from metal. Demand for their products grew as furniture buyers found metal to be attractive.

At first metal desks were plagued by standardization and sameness. Drab olive green and battle-ship gray were the only available colors in metal desks. Many more colors have now been added by each manufacturer. Designers can choose today from such shades as blue, brown, silvertone, and coral.

Metal is favored for a number of functional and maintenance reasons too. The increasing cost of building space in cities and a rise in maintenance and cleaning costs have made businesses of all sizes turn to metal furniture.

The modular concept of office furnishings illustrates how the versatility of metal furniture has helped hold down rising costs. A modular desk can be changed in appearance and function with different top sizes, number and shape of drawers, presence or absence of typewriter stands, etc. The office manager is able to change the appointments of a given desk to fit his changed needs, instead of buying a new desk. The modular desk is also built for tidiness and efficiency with a specific in-drawer space for working papers, pads, forms, card trays and even the telephone, thus freeing large amounts of working surface.

The ability of metal office furniture manufacturers to capitalize on the computer systems approach to furnishing an office has also provided

an impetus for growth. More offices are being designed around the computer and its accessories. The color and design of the computer housing usually dictates the decor for the entire office. The supplier of that metal housing often gets the order for conventional furniture too.

FUTURE PROSPECTS

Future demand for metal office furniture depends on growth in new office construction, replacement demand, and the trend toward modern office design. The tax surcharge coupled with high interest rates may temporarily slow the rising annual rate of new office construction. But the relative shortage of good office space in many

parts of the country and the growing demand for rental office space by service industries and all levels of government point to increased office construction over the long term. Higher demand for office furniture will result.

The replacement market should continue to give the industry a sound foundation. Most companies need to replace furniture as it wears out or buy improved items as they are developed. This helps make office furniture one of the more stable selling durable goods. Additionally, conversion from wood to metal is likely to continue.

Most important to future growth will be the modular and systems designs. On the basis of this past record, future innovation and rapid growth are realistic expectations.

**Table 1.—General Statistics
Metal Office Furniture—SIC 2522**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker manhour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (\$1,000)	Wages (\$1,000)					
1958.....	17,469	85,996	13,857	26,911	62,746	173,673	286,004	5,253	2.768	2.332
1959.....	17,727	92,038	14,230	28,029	67,249	200,848	322,742	5,551	2.987	2.399
1960.....	18,511	97,295	14,873	29,686	71,832	208,988	343,424	9,775	2.909	2.420
1961.....	17,432	92,022	13,759	27,449	67,199	199,289	329,254	6,208	2.966	2.448
1962.....	18,799	101,588	15,020	29,129	74,546	216,775	362,060	10,684	2.908	2.559
1963.....	19,928	112,080	15,752	31,531	81,427	228,329	389,965	14,199	2.804	2.582
1964.....	20,344	119,372	15,804	32,023	84,827	257,132	436,701	8,934	3.031	2.649
1965.....	21,746	134,327	17,059	35,867	93,573	290,497	493,842	11,665	3.104	2.609
1966.....	25,844	166,432	20,451	43,015	118,708	353,514	596,017	19,550	2.978	2.760
1967.....	¹ 27,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 660,500	N.A.	N.A.	N.A.
1968.....	¹ 28,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 730,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 2522.

**Table 4.—Number of Employees by Size of Establishment
Metal Office Furniture—SIC 2522**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	151	17,469	\$286	63	404	\$7	52	2,467	\$34	36	14,598	\$245
1963.....	170	19,928	390	63	399	6	62	3,169	52	45	16,360	331

Source: Bureau of the Census.

Table 5.—Key Ratios
Metal Office Furniture—SIC 2522

Item	1958	1963
Investment per production worker.....	¹ \$4,915	\$9,618
Specialization ratio (%).....	88	87
Concentration ratios (%):		
4 firms.....	38	33
8 firms.....	56	50
20 firms.....	80	75
50 firms.....	94	93

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Metal Office Furniture—SIC 2522

Geographic area	All employees	Geographic area	All employees
Total.....	19,928	North Central.....	9,160
New England.....	926	Ohio.....	3,379
Middle Atlantic.....	7,117	Indiana.....	602
New York.....	3,668	Michigan.....	2,126
		South.....	1,547
		West.....	1,178

Source: Bureau of the Census.

Table 7.—Principal Products
Metal Office Furniture—SIC 2522

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/68
Chairs, stools, couches, etc., including upholstered.....	59	67	67	67	70	74	85	99	123	2.10
Desks.....	66	80	87	80	86	88	99	110	158	2.38
Cabinets and cases.....	107	123	127	124	140	143	153	177	201	1.87
Other metal office furniture including tables, stands, etc.....	34	45	47	46	45	50	55	67	85	2.48
Metal office furniture, N.S.K.....	7	N.A.	N.A.	N.A.	N.A.	3	2	4	*5	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.S.K.=Not specified by kind.

N.C.=Not computed.

Source: Bureau of Census.

Motor Vehicles and Parts

SIC 3717

Over the past decade, the motor vehicles and parts industry has continued its dramatic growth as a major contributing industry to our economy. The 1968 value of motor vehicle and parts shipments rose to \$46.1 billion, a 121 percent increase from 1958. The estimated 8.4 million new car sales in 1968 is almost double 1958 sales. Total employment grew by 44 percent from 1958 to about 785,000 employees in 1968. Personal consumption expenditures for automobiles and parts continue as a leading expenditure accounting for approximately 40 percent of total personal consumption expenditures for all durable goods.

The growth of this industry over the past decade has not materially changed the geographic distribution of the industry's production. Michigan is still the center of the industry, producing 34 percent of total U.S. passenger cars while accounting for 40 percent of the total employment by motor vehicle and parts manufacturers.

Expenditures for new plant and equipment also showed substantial increases during this period. In 1958, establishments producing motor vehicles and parts spent about one-third of a billion dollars for this purpose. By 1965 and 1966, this figure more than trebled, accounting for, in each of these years, substantially more than a billion dollars.

GROWTH FACTORS

The growth of the motor vehicles and related parts industry far outstripped the increase in population during the past 10 years. To a large extent, this resulted from increase in standards of living, increased income per family and the spreading of our population to suburban areas. The motor vehicle has become a necessity rather

than a luxury. It is currently estimated that over 80 percent of commuting workers use automobiles for transportation. In the period from 1955 to 1967, the number of U.S. families has increased by 22 percent, while the percent of families owning automobiles has increased from 71 percent to 78 percent. Due to the increase in housewife and teenage drivers and the increase in use of automobiles on college campuses, the multicar households in the United States have also increased dramatically. In 1967, 25 percent of all U.S. households owned more than one car compared with 18 percent in 1960.

The commercial and industrial use of motor vehicles has also grown sharply. In today's complex economy, motor vehicles are used substantially in industrial material handling and delivery as well as for transportation and delivery in our service industries.

Technological developments have contributed their share to the growth of this industry. The increased use of reclining seats, air conditioning, stereo or hi-fi music, power brakes and power steering, etc. have made driving more comfortable, more enjoyable and more attractive than 10 years ago.

With the growth of automobile sales has come substantial growth in credit extended for this purpose. It is estimated that in 1967, over \$27 billion of credit was extended for this purpose—an increase of almost 65 percent from 1955.

During the past 10 years, there have been expansion and improvements in our national highway system and the development of recreational and other types of vacation centers which have contributed not only to the number of automobiles but also to their use.

FUTURE PROSPECTS

It is anticipated that the future growth rate of this industry will not be substantially greater than during the past 10 years. The factors influencing this future growth will be basically the same as those which have influenced it in the more recent past. Some of these factors are: increased leisure time, especially for people retiring at earlier ages and who are living longer, as well as for those whose vacation periods are becoming longer. Tied in with this will be improved highway systems which will permit people to drive to more distant places than previously possible for weekend or other short vacations.

The number of teenagers, new customers for automobiles, will continue to increase faster than the rest of our population.

Incomes for the average American family will increase substantially. It is projected that by 1985 the percentage of families earning over \$10 thousand (in 1966 dollars) will constitute almost two-thirds of the total U.S. families whereas in 1966, it constituted less than one-third. In 1967, 95 percent of households with incomes of \$10,000 or more owned cars.

The technological know-how of our automobile industry and the extensive research and development being carried on will be a determining factor in its future growth. In addition to the now normal comfort devices and the increase in safety devices, more emphasis is being placed on design with trends to "sporty" looking cars, attractive to many, especially young, automobile buyers. In addition, research is being conducted on the development of turbine and electric-powered automobiles which, if successful, could completely revolutionize the industry.

One dark cloud over the growth of this industry is the increasing competition from abroad. Imports of automobiles, principally from Canada, West Germany, United Kingdom, Japan, and Sweden, have more than doubled in the last decade. In 1967, \$1.7 billion worth of automobiles were imported—an increase of 128 percent from 1959. It is now projected that imports will continue to increase at a much faster rate than both U.S. production and U.S. exports to foreign countries.

To lessen the impact of imports on American industry, plans have recently been announced to produce smaller and less expensive compact models which are competitive with many of the imported cars.

**Table 1.—General Statistics
Motor Vehicles and Parts—SIC 3711**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	546,037	3,169,173	433,982	858,440	2,374,447	6,504,510	20,830,059	334,068	2.739	2.766
1959.....	599,912	3,914,529	489,423	1,057,969	3,019,106	8,915,412	26,712,803	386,609	2.953	2.854
1960.....	658,148	4,319,876	540,751	1,131,519	3,378,315	9,717,429	30,110,144	462,402	2.876	2.986
1961.....	569,619	3,779,955	460,339	945,118	2,881,527	8,541,738	25,847,658	381,601	2.964	3.049
1962.....	628,386	4,465,378	517,189	1,110,236	3,483,972	11,110,932	32,673,777	492,177	3.189	3.138
1963.....	649,926	4,947,271	535,842	1,192,606	3,889,636	12,345,630	36,181,007	643,555	3.174	3.261
1964.....	681,743	5,306,837	562,342	1,226,398	4,165,195	13,071,257	37,462,664	878,865	3.138	3.396
1965.....	776,826	6,352,575	647,382	1,428,261	5,054,409	15,908,289	46,430,579	1,232,851	3.147	3.539
1966.....	798,920	6,547,050	666,322	1,487,049	5,161,788	15,449,673	45,630,082	1,113,206	2.993	3.471
1967.....	¹ 753,300	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 42,865,000	N.A.	N.A.	N.A.
1968.....	¹ 785,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 46,080,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Motor Vehicles—(Passenger Cars Only)—SIC 3711

[Dollars in millions]

Year	Ex-ports	Im-ports	Factory sales	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$258.3	N.A.	\$ 8,010.4	3.2	N.A.
1959.....	220.2	\$743.9	10,534.4	2.1	6.6
1960.....	234.8	513.7	12,164.2	1.9	4.1
1961.....	215.1	306.5	10,285.8	2.1	2.9
1962.....	245.4	421.4	13,071.7	1.9	3.1
1963.....	266.5	445.1	14,427.1	1.8	3.0
1964.....	314.6	584.4	14,836.8	2.1	3.8
1965.....	393.3	669.9	18,380.0	2.1	3.5
1966.....	564.2	1,236.5	17,554.3	3.2	7.1
1967.....	811.6	1,695.0	² 15,600.0	² 5.2	² 9.8
1968.....	² 823.8	² 2,710.0	² 18,400.0	² 4.5	² 12.8

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Automobile Manufacturers Assoc.

Table 3.—Principal Trading Partners
Motor Vehicles—(Passenger Cars Only)—SIC 3711

United States buys from—

United States sells to—

Canada
West Germany
United Kingdom
Sweden
Japan
France

Canada
Mexico
Australia
Venezuela
Peru
Republic of South Africa

Source: Automobile Manufacturers Assoc.

Table 4.—Number of Employees by Size of Establishment
Motor Vehicles and Parts—SIC 3711

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments
1958.....	1,551	541,510	(¹)	807	5,052	(¹)	333	15,206	(¹)	411	521,252	(¹)
1963.....	1,958	649,926	(¹)	1,049	6,200	(¹)	468	21,475	(¹)	441	622,251	(¹)

¹ Value of shipment omitted, includes extensive duplication.

Source: Bureau of the Census.

Table 5.—Key Ratios
Motor Vehicles and Parts—SIC 3711

Item	1958	1963
Investment per production worker	N.A.	\$14,885
Specialization ratio (%).....	N.A.	N.A.
Concentration ratios (%):		
4 firms.....	75	79
8 firms.....	81	83
20 firms.....	89	90
50 firms.....	94	94

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Motor Vehicles and Parts—SIC 3711

Geographic area	All em-employees	Geographic area	All em-employees
Total.....	649,926	South Atlantic.....	25,550
New England.....	7,224	North Carolina.....	1,102
Connecticut.....	3,694	Florida.....	374
Middle Atlantic.....	64,148	East South Central.....	9,930
New York.....	38,389	Alabama.....	846
East North Central.....	479,355	Mississippi.....	1,523
Indiana.....	56,962	West South Central.....	7,633
Michigan.....	261,154	Oklahoma.....	1,201
Ohio.....	105,218	Mountain.....	993
West North Central.....	29,522	Colorado.....	677
Iowa.....	526	Pacific.....	25,571
		California.....	23,194

Source: Bureau of the Census.

Table 7.—Principal Products
Motor Vehicles and Parts—SIC 3711

[Dollars in millions]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/68
Passenger cars, knocked down or assembled.....	9,218	11,999	14,009	11,788	15,053	16,768	17,396	21,852	21,157	2.30
Truck tractors, truck chassis and trucks (chassis of own manufacture).....	1,934	2,490	2,573	2,376	3,010	3,376	3,442	4,289	4,656	2.41
Motor coaches (excluding trolley busses) and fire department vehicles (chassis of own manufacture).....	99	107	157	155	161	182	176	170	198	2.00
Parts and accessories for passenger cars, trucks and busses shipped to motor vehicle manufacturers.....	7,327	9,482	10,688	9,139	11,650	12,922	13,323	16,457	15,894	2.17
Parts and accessories for passenger cars, trucks, and buses, shipped to other than motor vehicle manufacturers.....	1,141	1,439	1,486	1,443	1,728	1,754	1,825	2,000	2,169	1.90
Rebuilt automotive parts (excluding carburetors).....	80	96	99	102	110	188	182	187	188	2.35
Combat vehicles and motor vehicle and parts, N.S.K.....	65	N.A.	N.A.	N.A.	N.A.	222	*160	231	317	4.86

*Standard error of estimate of 15 percent or more.
N.A.=Not available.

Source: Bureau of the Census.

Newspapers

SIC 2711

Unprecedented growth by every measurement has characterized the newspaper industry during the past ten years. Employment grew by more than 18 percent to a total of over 350,000. Circulation of all newspapers—daily, Sunday, and weekly—increased by 13 percent over the decade, while advertising revenue rose 54 percent, and value of shipments and value of receipts gained by more than 60 percent.

GROWTH FACTORS

A technological revolution in the production of newspapers has been a major factor in the growth of the industry. From 1958 through 1966, capital expenditures exceeded \$1½ billion, much of this investment going into advanced types of production equipment. Among the most exotic of these are computer systems, now in use in some 300 newspapers, and a new web offset process with almost 450 daily and well over one-third of the weekly newspapers planned to have capability by the end of 1968. The larger daily newspapers have also made huge investments in new letterpress equipment, and all segments of the industry have invested in new plants and facilities.

Basic to the growth of the industry in the past decade has been an explosion in the interest in, and need for, the printed word, reflecting our rapidly growing and better educated population and the increasing complexity of an advanced technological environment.

The most important segment of the population for the newspaper industry is the 21-64 age group. This is the reading age group whose rapid expansion has contributed so significantly to the demand for newspapers.

For many years prior to World War II, the newspaper industry met its growth needs by simply adding to its conventional production equipment. During the depression years it was neither possible nor necessary to innovate or expand, while during the war years—through the end of the Korean conflict—expansion and innovation, though desirable, were not feasible. In the mid- and late fifties, as the industry and its suppliers struggled to replace wornout and outmoded equipment and operating methods, the technological revolution began to have its impact.

Changes came slowly at first, but the newspaper industry today is in the midst of the most dynamic expansion in its history.

Newspaper circulation has more than kept pace with the growth of the adult reading population during the past 10 years, despite the rapid expansion of a major competing communications medium—television. Potential customers for newspapers will continue to increase, as the number of households will rise 17 million by 1980, according to the Bureau of the Census. Newspapers attract the largest portion of the advertising dollar, almost 30 percent—nearly double television's share.

Multiple readership is expected to increase because of at least three trends: an increasingly better educated population; a population with more leisure time; and the prospective renaissance of mass transportation, where passengers can read while riding. In addition, other media—especially radio and TV—have served to make the public more news-conscious, stimulating interest and curiosity and causing people to look to newspapers for details as well as background and interpretation.

FUTURE PROSPECTS

Meeting this challenge of increased service to the public calls for the industry to take full advantage of the new technologies now available and to hasten the advent of those under development and in the research state. While completely new forms of transmission of the printed word to the reader are now technically feasible—facsimile transmission direct from the newsroom into the home, for example—cost factors alone would prevent widespread adoption of such radically new systems in the next decade and beyond. There are, however, more practical innovations that will be adopted and expanded. Among these, are the increased use of web offset printing, computerized phototypesetting, automated distribution systems, and greatly increased capability for reproduction of full color in both editorial and advertising columns. Electronic press controls,

computer operated, will bring greater efficiency to the press room. Marketing of a durable plastic printing plate will be a reality and significantly reduce production costs in letterpress operations. These and a host of related devices, equipment and supplies are ushering in a new era of more effective newspaper production.

The soaring costs of more sophisticated equipment requires alert and efficient management. One of the major problems to which much attention must be directed is the relationship between management and labor. The industry's growth, health and wellbeing depend to a large measure on improvement in labor relations. The workers' fear that technological changes and automation would reduce the number of jobs has not been borne out; rather, they have enhanced job opportunities and resulted in record employment in the industry. Under wise guidance this trend should continue in the future.

**Table 1.—General Statistics
Newspapers—SIC 2711**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	295,622	1,499,939	154,656	278,024	778,957	2,528,774	3,628,021	148,209	3.246	2.802
1959.....	300,909	1,601,283	158,078	292,271	841,066	2,766,154	3,946,642	147,604	3.289	2.878
1960.....	307,423	1,673,879	158,880	299,627	882,937	2,924,534	4,136,622	122,828	3.312	2.947
1961.....	308,453	1,712,086	160,688	297,743	899,980	2,939,501	4,182,997	134,487	3.266	3.023
1962.....	310,742	1,761,008	163,151	297,094	929,513	3,051,602	4,319,499	123,858	3.283	3.129
1963.....	306,439	1,784,570	160,061	294,541	935,160	3,201,872	4,483,592	135,198	3.424	3.175
1964.....	317,885	1,901,091	166,339	319,904	997,785	3,460,848	4,820,378	121,602	3.460	3.119
1965.....	327,731	2,006,385	167,562	303,836	1,043,632	3,731,677	5,156,064	169,973	3.576	3.435
1966.....	333,490	2,121,216	167,608	313,527	1,091,374	4,012,212	5,520,202	227,793	3.676	3.481
1967.....	¹ 343,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 5,818,000	N.A.	N.A.	N.A.
1968.....	¹ 350,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 6,132,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census; and BDSA (1967 and 1968 data).

**Table 2.—Major Measures of Industry Growth
Newspapers—SIC 2711**

Year	Number of and circulation of newspapers						Newsprint ² consumption (thousand tons)	Adver- tising, total volume (millions)
	Daily		Sunday		Weekly ¹			
	Num- ber	Circu- lation (mil- lions)	Num- ber	Circu- lation (mil- lions)	Num- ber	Circu- lation (mil- lions)		
1958.....	1,751	57.4	558	47.0	8,268	18.7	6,515	\$3,192.8
1959.....	1,761	58.3	564	47.9	8,287	20.2	7,037	3,546.0
1960.....	1,763	58.9	563	47.7	8,174	21.0	7,332	3,702.8
1961.....	1,761	59.3	558	48.2	8,153	22.8	7,386	3,623.1
1962.....	1,760	59.8	558	48.9	8,158	23.4	7,428	3,681.4
1963.....	1,754	58.9	550	46.8	8,151	24.0	7,577	3,803.9
1964.....	1,763	60.4	561	48.4	8,061	25.0	8,092	4,148.0
1965.....	1,751	60.4	562	48.6	8,003	26.1	8,433	4,456.5
1966.....	1,754	61.4	578	49.3	8,012	26.9	9,123	4,895.0
1967.....	1,749	61.6	573	49.2	7,985	N.A.	³ 9,300	⁴ 4,900.0
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	³ 9,700	⁵ 5,500.0

¹ Includes newspapers published semiweekly and triweekly.

² Represents newsprint consumption by all U.S. industries—consumption by U.S. newspapers is approximately 93 percent of total.

³ Estimated by BDSA.

⁴ Preliminary estimate; Marketing/communications.

⁵ Estimate by Bureau of Advertising, ANPA.

N.A.=Not available.

Sources: "Number of and Circulation of Newspapers, Daily and Sunday," Editor and Publisher International Yearbook; "Number of and Circulation of Newspapers, Weekly," American Newspaper Representatives National Directory of Weekly Newspapers; "Newsprint Consumption," Bureau of the Census; "Advertising, Total Volume," Marketing/Communications (formerly Printers' Ink).

Table 3.—Value of Receipts**Newspapers—SIC 2711**

[In millions of dollars]

Year	Daily and Sunday		Weekly and other		Newspapers, N.S.K., subscrip- tions, sales and advertising	Total
	Subscription and sales	Advertising	Subscription and sales	Advertising		
1958.....	917	2,209	63	235	35	3,458
1959.....	955	2,441	71	249	(51)	3,767
1960.....	994	2,542	73	264	(47)	3,920
1961.....	1,043	2,545	71	258	(37)	3,955
1962.....	1,062	2,655	80	261	(32)	4,089
1963.....	1,064	2,728	83	296	84	4,255
1964.....	1,157	2,966	87	314	(96)	4,620
1965.....	1,177	3,167	94	332	(117)	4,886
1966.....	1,218	3,470	109	380	(79)	5,256
1967.....	N.A.	N.A.	N.A.	N.A.	N.A.	1 5,466
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.	1 5,635

¹ Estimated by BDSA.

N.A.=Not available.

N.S.K.=Not specified by kind.

Note.—The figures shown in parentheses have associated standard errors exceeding 15 percent. These estimates may be of limited reliability. However, when combined with other product class totals into broader aggregates they are of acceptable reliability.

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishments**Newspapers—SIC 2711**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	8,250	294,258	\$3,628	6,526	36,200	\$311	1,258	52,338	\$478	466	205,720	\$2,833
1963.....	8,331	306,439	4,484	6,466	35,197	347	1,346	55,132	574	519	216,110	3,563

Source: Bureau of the Census.

Table 5.—Key Ratios**Newspapers—SIC 2711**

Item	1958	1963
Investment per employee.....	¹ \$8,874	\$12,210
Specialization Ratio (%).....	96	96
Concentration Ratios (%):		
4 firms.....	17	15
8 firms.....	24	22
20 firms.....	35	36
50 firms.....	51	52

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963**Newspapers—SIC 2711**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	306,439	South Atlantic—Continued	
New England.....	23,089	West Virginia.....	2,304
Maine.....	1,600	North Carolina.....	5,232
New Hampshire.....	1,153	Georgia.....	4,277
Vermont.....	636	Florida.....	10,241
Massachusetts.....	13,013	East South Central.....	11,996
Rhode Island.....	1,610	Kentucky.....	3,013
Connecticut.....	5,077	Tennessee.....	4,533
Middle Atlantic.....	62,614	Alabama.....	2,941
New York.....	32,851	Mississippi.....	1,509
New Jersey.....	9,464	West South Central.....	22,983
Pennsylvania.....	20,299	Arkansas.....	2,096
East North Central.....	63,066	Louisiana.....	3,247
Indiana.....	8,564	Oklahoma.....	3,580
Illinois.....	19,507	Texas.....	14,060
Michigan.....	11,339	Mountain.....	12,424
Wisconsin.....	7,423	Montana.....	1,173
Ohio.....	16,233	Idaho.....	1,017
West North Central.....	28,248	Wyoming.....	542
Minnesota.....	6,516	Colorado.....	3,947
Iowa.....	6,025	New Mexico.....	1,015
Missouri.....	7,613	Arizona.....	2,631
North Dakota.....	1,046	Utah.....	1,172
South Dakota.....	1,160	Nevada.....	927
Nebraska.....	2,621	Pacific.....	43,234
Kansas.....	3,267	Washington.....	5,301
South Atlantic.....	38,785	Oregon.....	3,281
Maryland.....	4,294	California.....	33,297
District of Columbia.....	4,789	Alaska.....	299
Virginia.....	4,799	Hawaii.....	1,056

Source: Bureau of the Census.

Table 7.—Principal Products
Newspapers—SIC 2711

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Daily and Sunday, newspapers, subscriptions and sales.....	917	955	994	1,043	1,062	1,064	1,157	1,177	1,218	1.33
Daily and Sunday, newspapers, advertising receipts.....	2,209	2,441	2,542	2,545	2,655	2,728	2,966	3,167	3,470	1.57
Weekly and other newspapers, subscriptions and sales.....	63	71	73	71	80	83	87	94	109	1.74
Weekly and other, newspapers, advertising receipts.....	235	249	264	258	261	296	314	332	380	1.62
Newspapers, N.S.K.....	35	1 51	1 47	1 37	1 32	84	1 96	1 117	1 79	N.C.

¹ Standard error of estimate of 15 percent or more.
N.C.= Not computed.

N.S.K.= Not specified by kind.
Source: Bureau of the Census.

Optical Instruments and Lenses

SIC 3831

One of the most rapidly expanding industries in the United States is optical equipment and lenses. The estimated 1968 value of shipments for this industry is about 250 percent higher than in 1958. Employment has also sharply increased to 19,000 persons or more than 175 percent over 1958.

Although still comparatively small, the optical equipment and lens industry is providing valuable tools for such diverse activities as space exploration, defense, science, medicine, agriculture and other industries. Known a decade ago for such relatively mundane products as telescopes and binoculars, the industry is now commonly mentioned in the same breath with aerospace and electronics.

GROWTH FACTORS

Since World War II the optical equipment and lens industry has benefited from three primary, interdependent sources of demand.

First, the growing complexity of advanced scientific and technological developments has created a need for increasingly precise analytical and control instruments.

Second, defense needs have placed a premium on camera systems with high resolution lenses and precise guidance controls for high altitude aerial reconnaissance. Complex tracking telescopes were also built in response to military needs.

Finally, the space age dramatically affected all segments of the industry. Science education was given number one priority by the Federal Government, creating heavy demand for telescopes and microscopes for schools and colleges. Science and industry have also required even better optical instruments to design and manufacture rockets and satellites.

Progress in computer development has enabled optical manufacturers to satisfy their new found sources of demand. The time-consuming job of determining lens curvatures and designs is now far more simple. Even more important the use of the computer to simulate mathematically the testing of new lens systems has cut costs and helped in designing optical devices too complex to be built by trial and error.

One of the first technological breakthroughs was infrared spectrophotometry, a process used for identifying the different organic molecules in a substance by their reaction to infrared light. Spectrophotometry has been used to pinpoint ingredients such as metallic elements in a mixture down to a few parts in a billion, detecting impurities in organic solutions and in process controls.

High-precision measuring instruments have been developed by optical manufacturers to assist analytical devices like the spectrophotometer. Before the arrival of the space age, tolerances of 1/10,000th of an inch were considered exceptional. Aerospace production needs however made tolerances of 1/10,000th of an inch almost an absolute requirement. Mechanical measuring is inadequate because it involves too many human variables.

Optical measuring however does not require human handling of the object to be measured, involves less human judgment, and can probe and take readings in areas inaccessible to mechanical devices. Thousands of twin optic or stereo microscopes are now found on assembly lines. The microelectronic chip, the key to the integrated circuit revolution in electronics, can only be worked on under these high precision optical instruments.

High-speed, high altitude aerial reconnaissance was made possible by lens systems developed by firms in the optical equipment and lens industry. More recently, the U.S. Air Force spy-in-the-sky satellite, Samos, has utilized similar equipment. The world has marveled at pictures of the Earth, Moon, and Mars taken through high resolution lenses. Fiber optics has been another important area for optical industry growth. Glass in fiber optic instruments is drawn so thinly that light rays entering one end of the glass fibers travel through to the other end, no matter how the fibers are bent. Some practical applications of fiber optics include picture taking inside the hollow cores of nuclear reactor fuel rods to check for dangerous leaks, examining the inside of the human stomach, heart, and other organs, and making voiceprints whose reliability for human identification purposes is thought to equal that of the fingerprint.

FUTURE PROSPECTS

Future growth in the optical equipment and lens industry is heavily dependent on advances

in technology. It is difficult therefore to make an accurate estimate of the long-term picture. But, trends relating to past areas of growth do point toward even more rapid growth in the future. The estimated decline in shipments in 1968 reflects a cutback in R. & D. expenditures for optical equipment by the Federal Government. Such expenditures are likely to resume their upward climb in the future.

High precision measuring instruments and automatic analytical devices will be needed in greater number to help industry cope with complex production requirements. While space expenditures may continue to decline during the next few years, the longer term outlook is for heavy spending that will create significant demand for lenses and other optical goods. Optical requirements for the military should remain near their present levels.

Finally, breakthroughs may occur in fiber optics to permit such things as long-distance transmission of images and data or data-display systems linked to a computer. The success of either would provide a dramatic incentive for industry growth.

Table 1.—General Statistics
Optical Instruments and Lenses—SIC 3831

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	7,184	37,586	5,141	10,485	23,459	60,387	102,966	3,438	2.574	2.238 ⁷
1959.....	8,720	50,742	6,551	13,775	31,654	81,515	134,764	N.A.	2.575	2.292
1960.....	8,041	51,136	5,727	11,629	30,610	79,406	124,247	3,614	2.594	2.636
1961.....	7,881	51,214	5,428	10,684	29,129	65,731	103,363	8,556	2.257	2.720
1962.....	8,318	59,019	5,878	12,030	33,800	83,771	134,153	8,190	2.478	2.810
1963.....	11,924	79,131	8,306	16,728	47,149	131,917	196,022	6,163	2.798	2.819
1964.....	15,140	104,011	9,829	19,704	58,047	176,921	253,359	6,320	3.048	2.945
1965.....	15,656	116,496	10,177	21,561	65,264	205,364	291,418	7,816	3.147	3.027
1966.....	17,433	131,710	10,798	22,699	70,233	225,460	332,402	12,915	3.210	3.094
1967.....	¹ 19,316	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 347,000	N.A.	N.A.	N.A.
1968.....	¹ 19,065	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 344,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3831.

Table 4.—Number of Employees by Size of Establishment
Optical Instruments and Lenses—SIC 3831

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments
1958.....	224	7,184	\$103	166	901	\$12	42	1,470	\$19	16	4,813	\$73
1963.....	280	11,924	196	201	1,188	18	51	2,150	32	28	8,586	146

Source: Bureau of the Census.

Table 5.—Key Ratios
Optical Instruments and Lenses—SIC 3831

Item	1958	1963
Investment per production worker.....	¹ \$6,606	\$7,378
Specialization ratio (%).....	90	90
Concentration ratios (%):		
4 firms.....	46	41
8 firms.....	60	53
20 firms.....	74	73
50 firms.....	88	87

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Optical Instruments and Lenses—SIC 3831

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	11,924	West North Central.....	350
New England.....	3,603	Missouri.....	282
Middle Atlantic.....	4,020	South.....	775
New York.....	3,070	Mountain.....	14
New Jersey.....	206	Pacific.....	2,091
Pennsylvania.....	744	California.....	2,020
East North Central.....	1,071		
Illinois.....	682		

Source: Bureau of the Census.

Table 7.—Principal Products
Optical Instruments and Lenses—SIC 3831

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Optical instruments and lenses, excluding sighting and fire control equipment.....	N.A.	N.A.	N.A.	N.A.	N.A.	213	236	266	317	N.A.
Sighting and fire control equipment made from lenses, prisms, etc., produced in the same plant.....	N.A.	N.A.	N.A.	N.A.	N.A.	51	34	35	36	N.A.
Optical instruments and lenses, N.S.K.....	N.A.	N.A.	N.A.	N.A.	N.A.	6	5	7	8	N.C.

N.A.=Not available.
N.C.=Not computed.
N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Organic Chemicals

SIC 2818

Shipments of the organic chemicals industry increased about 150 percent during the last 10 years, while employment in the industry advanced about 30 percent. Organic chemicals are usually capital-intensive operations with high productivity, relatively high wages, skilled labor, and low labor turnover. Output can be increased with relatively small additions to the labor force.

Organic chemicals are produced primarily in the West South Central States, with the South Atlantic and Middle Atlantic States vying for second place. Plants have tended to be established near sources of primary raw materials, e.g. petroleum refineries and natural gas processing plants.

Organic chemicals are substances derived from hydrocarbons through one or more transformations. They are the basis themselves for literally thousands of other products. Organic chemicals are made commercially by the separation, combination, or reaction of other chemicals and materials. Hydrocarbons for these organic chemicals are obtained from petroleum (petrochemicals), coal and derivatives, and other sources.

Basic or first generation hydrocarbons are classified according to where they are made, e.g. petroleum refineries (industry 2911), and coke ovens (industry 3312). These basic chemicals can be used directly, or they can be processed into cyclic intermediates (industry 2815), or be made into other organic chemicals. Establishments making organic chemicals often make products classified in several industries; consequently, the specialization and coverage ratios of the organic chemicals industry are comparatively low.

Prices of organic chemicals, in general, are at about 1957 levels, and the availability of these chemicals at low and/or stable prices has contributed to their acceptance and growth.

Organic chemicals have also found their way into many uses by the military, primarily in the form of products. The effect of a change in military spending is difficult to assess, except for those individual chemicals with uniquely military uses.

Exports of the types of chemicals produced by the organic chemicals industry have just about tripled during the past 10 years to an estimated \$800 million. There has been dynamic foreign growth in the production of organic chemicals, including considerable investment by U.S. companies; this will no doubt affect the growth rate of exports but with rapidly rising world demand for organic chemicals and the continuing appearance of new chemicals as a result of research, exports should remain a significant and growing market for organic chemicals.

GROWTH FACTORS

Since organic chemicals are used by or in many manufacturing and service industries, the level of economic activity of many segments of the economy—from increased use of insulated wire in electronic apparatus to more cleaning compounds used by laundries and dry cleaners—affects the growth rate of the organic chemicals industry. Of special importance, however, is the fact that organic chemicals are basic materials used in other chemical industries, including such rapidly growing industries as: (1) plastics materials, (2) synthetic rubber, (3) synthetic organic fibers, (4) toilet preparations, and (5) detergents.

Technology creates significant markets for this industry. The development and availability of new commercial products has fostered the growth and development of consumers of organic chemicals, resulting in large increases in demand, for organic

chemicals. The cycle tends to stimulate itself. Research and development create new, low cost, commercial chemicals which in turn permit the development of new plastics, synthetic organic fibers, etc., which stimulates the organic chemicals industry and leads to new expenditures for research and development.

Research and development expenditures for all industrial chemicals have increased from \$553 million in 1958 to an estimated \$1.1 billion in 1968. Although there are no official statistics indicating the amount spent on the various types of chemicals, it is estimated that about three quarters of total research and development expenditures for industrial chemicals are in the area of organic chemicals. New capital expenditures for the

organic chemicals industry rose rapidly from \$268 million in 1962 to \$886 million in 1966; according to trade sources, these expenditures leveled off at about \$900 million annually during 1967 and 1968.

FUTURE PROSPECTS

The major consumers of organic chemicals, such as manufacturers of plastics, synthetic rubber, synthetic fibers, etc., are rapidly growing industries whose future growth is very promising. If the organic chemicals producers are able to maintain an adequate source of low priced raw materials, e.g. petroleum derivatives, future annual growth may be 10 percent or more annually, as demand for present products rises and the development of new products results in new markets.

**Table 1.—General Statistics
Organic Chemicals—SIC 2818**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958	77,442	508,433	51,966	103,917	312,380	1,725,700	3,097,963	330,317	5.525	3.006
1959	76,156	528,260	52,906	105,016	330,116	2,040,429	3,609,240	224,259	6.181	3.143
1960	78,039	560,440	54,310	107,535	344,797	2,080,697	3,712,940	297,703	6.035	3.206
1961	82,418	619,030	56,482	115,111	387,153	2,198,918	3,947,178	380,552	5.680	3.363
1962	82,422	633,864	56,154	113,665	390,795	2,511,416	4,430,051	267,949	6.426	3.438
1963	85,492	677,252	56,370	114,438	405,019	2,727,450	4,840,176	400,981	6.734	3.539
1964	87,102	714,044	56,973	117,550	428,645	2,990,939	5,265,286	496,449	6.978	3.646
1965	91,635	768,001	61,255	125,157	462,491	3,471,661	6,012,494	641,245	7.506	3.695
1966	95,727	833,367	63,616	129,018	491,577	3,641,454	6,541,085	886,223	7.408	3.810
1967	¹ 101,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 7,060,000	N.A.	N.A.	N.A.
1968	¹ 104,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 7,700,000	N.A.	N.A.	N.A.

¹ Estimated. N.A.=Not available. Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Organic Chemicals—SIC 2818**

[Dollars in millions]

Year	Ex-ports	Im-ports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958	N.A.	\$40	\$2,787	N.A.	1.4
1959	N.A.	47	3,150	N.A.	1.5
1960	\$189	59	3,236	5.8	1.8
1961	183	60	3,284	5.6	1.8
1962	305	68	3,680	8.3	1.8
1963	341	74	4,184	8.2	1.7
1964	449	90	4,457	10.1	2.0
1965	468	101	5,023	9.3	2.0
1966	877	123	5,366	16.3	2.2
1967	677	132	² 5,700	² 11.9	² 2.3
1968	² 740	² 145	² 6,200	² 11.9	² 2.3

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Organic Chemicals—SIC 2818**

United States buys from—	United States sells to—
Canada United Kingdom West Germany Japan	Canada Netherlands United Kingdom Japan West Germany

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Organic Chemicals—SIC 2818

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments	Establish-ments	Em- ployees	Ship- ments
1958.....	334	77,442	\$3,098	149	965	\$36	99	4,794	\$231	86	71,683	\$2,831
1963.....	464	85,492	4,840	223	1,164	62	119	5,660	388	122	78,668	4,390

Source: Bureau of the Census.

Table 5.—Key Ratios
Organic Chemicals—SIC 2818

Item	1958	1963
Investment per production worker.....	¹ \$51,288	\$83,788
Specialization Ratio (%).....	73	72
Concentration Ratios (%):		
4 firms.....	55	51
8 firms.....	70	63
20 firms.....	85	79
50 firms.....	96	93

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Organic Chemicals—SIC 2818

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	85,492	South Atlantic.....	12,274
New England.....	3,262	West Virginia.....	10,222
Massachusetts.....	1,009	North Carolina.....	236
Rhode Island.....	146	East South Central.....	6,002
Middle Atlantic.....	21,591	Kentucky.....	1,970
New York.....	5,777	Tennessee.....	3,660
New Jersey.....	13,786	Alabama.....	372
Pennsylvania.....	2,028	West South Central.....	25,058
East North Central.....	12,260	Texas.....	19,324
Indiana.....	1,364	Mountain.....	216
Illinois.....	2,627	Pacific.....	2,372
Michigan.....	6,166	California.....	2,281
Wisconsin.....	213		
Ohio.....	1,890		
West North Central.....	2,457		

Source: Bureau of the Census.

Table 7.—Principal Products
Organic Chemicals—SIC 2818

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Miscellaneous cyclic chemical products.....	143	142	146	156	159	201	213	233	264	1.84
Miscellaneous acyclic chemical and chemical products.....	2,127	2,356	2,414	2,416	2,730	3,129	3,308	3,773	3,995	1.88
Synthetic organic chemicals, N.E.C. (excluding bulk surface active agents).....	291	372	372	382	408	427	461	514	575	1.97
Pesticides and other organic agricultural chemicals (not formulations).....	96	123	147	165	220	223	246	261	293	3.04
Ethyl alcohol and other industrial organic chemicals, N.E.C.....	121	N.A.	N.A.	N.A.	158	192	220	232	229	1.88
Organic chemicals, N.S.K.....	8	N.A.	N.A.	N.A.	N.A.	12	9	¹ 11	¹ 11	N.C.

¹ Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.C.=Not computed.

N.E.C.=Not elsewhere classified.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Paper Mills, Except Building

SIC 2621

In the past decade the value of annual shipments by the U.S. paper industry has increased by about two-thirds, to a total of over \$5 billion, while the wholesale price of paper has gone up about 10 percent. Employment in the paper industry has risen only marginally in that period. Productivity, measured in terms of value of shipments per production worker, has grown fairly substantially. Paper mills throughout the country have participated in the industry's growth. However, approximately three-fourths of the productive capacity is located in the Southern and Western States.

GROWTH FACTORS

The recent growth in the paper industry reflects the rise in the population, the introduction of a number of new paper products, advances in technology which have made paper more competitive with other materials, and the increased use of paper that goes with a general rise in the standard of living in this country.

Americans are using more and more disposable products made of paper in place of goods that require frequent repair and servicing. Paper clothing, towels, napkins and dishes are examples of this trend. It is likely that the trend toward more disposable paper products will continue as living standards rise.

In recent years the paper industry has made large investments in continuous pulping, in faster and wider paper machines, in automatic process controls, and in other aspects of production. To a large extent these investments have changed the nature of the paper industry. They account for a sizable share of the rise in labor productivity mentioned above. Moreover, new developments in the past few years have made it possible to give

paper the texture and strength to compete with woven fabrics in many uses. Further, paper is being used in combination with plastics and textile fibers to make a number of disposable products.

While the paper industry allocates proportionately less of the sales dollar to research and development than the average for all industry, it benefits substantially from the research activities of the U.S. Forest Products Laboratory and other public programs. Research and development activities in connection with the paper industry range from land utilization through papermaking techniques to market analyses.

U.S. exports of paper have been growing at the rate of about 3-4 percent annually in recent years. It is noteworthy in this connection that the consumption of paper in the Common Market countries has increased 32 percent over the past 5 years. The per capita consumption of paper in Europe and Japan, however, is still only a third of that in the United States while all countries outside the United States consume on the average only about 8 percent as much paper per capita as does the average American. As a consequence, the potential for U.S. exports of paper is great.

The rise in living standards and levels of education experienced by Americans over the years has been reflected in a growing demand for books, magazines, and newspapers. Also of great importance to the paper industry's growth have been the advances in packaging that have characterized the consumer-oriented economy of this country.

FUTURE PROSPECTS

The U.S. market for paper will continue to grow as new uses are found for paper. Disposable articles made of paper will become more widely

accepted and will contribute to the growth of the industry.

The paper industry should benefit to a substantial extent from the tariff reductions negotiated in the Kennedy Round. The reductions by U.S. trading partners are especially important in view of the much more rapid rate of growth in the demand for paper abroad than in this country. Some industry sources foresee an increase of 30 percent or

more in U.S. exports of paper in the next 5 years.

Finally, the substantial increases in productive capacity and advances in techniques in recent years provide the base for continuing growth in the paper industry. This production base, along with improved marketing policies and methods that aid in judging consumer demand and adapting product lines to that demand, should insure continued growth in the industry.

Table 1.—General Statistics
Paper Mills, Except Building—SIC 2621

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	131,334	740,988	109,266	238,433	570,040	1,542,746	3,259,415	258,769	2.076	2.391
1959.....	134,799	790,174	111,805	247,826	614,642	1,829,909	3,668,595	214,497	2.977	2.480
1960.....	136,665	820,311	112,702	246,257	629,916	1,876,971	3,754,677	246,474	2.980	2,558
1961.....	132,423	817,960	108,447	237,487	638,057	1,865,237	3,712,941	285,235	2.923	2,687
1962.....	132,348	859,852	108,714	238,277	663,545	1,904,949	3,857,202	277,098	2.871	2,785
1963.....	129,848	877,942	105,636	234,596	682,034	1,857,203	3,824,915	232,779	2.723	2,907
1964.....	129,638	917,573	105,807	235,972	709,874	1,973,953	4,000,030	295,580	2.781	3,008
1965.....	132,633	963,314	107,241	238,067	743,329	2,066,160	4,318,190	496,239	2.780	3,122
1966.....	135,018	1,043,333	109,067	246,175	804,396	2,330,345	4,804,788	574,992	2.897	3,268
1967 ¹	137,853	N.A.	N.A.	N.A.	N.A.	N.A.	4,857,855	N.A.	N.A.	N.A.
1968 ¹	139,900	N.A.	N.A.	N.A.	N.A.	N.A.	5,076,480	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 not relevant to SIC 2621.

Table 4.—Number of Employees by Size of Establishment
Paper Mills Except Building—SIC 2621

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	354	131,334	\$3,259	36	226	\$4	84	4,610	\$123	234	126,498	\$3,133
1963.....	325	129,848	3,825	12	121	3	83	4,715	145	230	125,012	3,677

Source: Bureau of the Census.

Table 5.—Key Ratios
Paper Mills Except Building—SIC 2621

Item	1963
Investment per production worker.....	\$39,200
Specialization ratio (%).....	90
Concentration ratios (%):	
4 firms.....	26
8 firms.....	42
20 firms.....	63
50 firms.....	85

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Paper Mills Except Building—SIC 2621

Geographic area	All employees	Geographic area	All employees
Total	129,848	West North Central	4,747
New England	27,200	Minnesota	4,747
Maine	13,526	South Atlantic	12,202
New Hampshire	2,290	Delaware	195
Vermont	529	Virginia	2,052
Massachusetts	10,224	North Carolina	5,369
Connecticut	631	East South Central	9,554
Middle Atlantic	24,576	Alabama	5,399
New York	11,974	West South Central	8,669
New Jersey	3,057	Arkansas	2,229
Pennsylvania	9,545	West	11,281
East North Central	31,619	Washington	7,332
Michigan	5,467	Oregon	2,781
Wisconsin	18,120		
Ohio	7,508		

Source: Bureau of the Census.

Table 7.—Principal Products
Paper Mills Except Building—SIC 2621

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Newsprint	215	240	249	256	266	271	277	276	316	1.47
Groundwood paper, uncoated	144	157	167	158	154	166	173	187	206	1.43
Paper-machine coated paper	363	405	405	404	430	499	538	612	702	1.94
Book paper, uncoated	426	481	504	483	500	500	518	550	653	1.53
Fine paper, including thin paper	568	658	665	681	722	763	791	865	969	1.70
Coarse paper	712	769	757	747	747	721	736	789	839	1.18
Special industrial paper	176	213	220	231	247	255	280	296	335	1.90
Sanitary tissue stock and other tissue paper, N.E.C.	440	496	529	538	557	547	559	608	638	1.45
Paper mills, except building, N.S.K.	N.A.	*19	N.A.	N.A.	N.A.	3	3	10	5	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.C.=Not computed.

N.E.C.=Not elsewhere classified.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Petroleum Refining

SIC 2911

Value of shipments of the expanding petroleum refining industry increased from \$14.5 billion in 1958 to an estimated \$20.2 billion in 1968. With increasing technological innovation in this highly sophisticated industry, employment has continued to decline.

Refinery capacity of 3.15 billion barrels a year in 1956, or 8.6 million barrels a day, climbed to 3.83 billion barrels a year, or 10.5 million barrels a day in 1966.

Location of refineries is dictated principally by ease of access to crude oil. There is a heavy concentration of plants in the Texas-Louisiana Gulf area, which consume domestic crude oil. An East Coast concentration between Maryland and Rhode Island, utilizes imported crude oil. Some refineries, notably those in the Chicago area, are market oriented. Lesser concentrations are found in northern and southern California. These have access to both domestic and foreign crude oil and are conveniently located near substantial refinery product markets.

GROWTH FACTORS

The past decade has seen gradual elimination of the petroleum refining industry's most vexing problem—overcapacity. Growth in dollar shipments and in refining capacity can be attributed to increased transportation demand for the industry's products. Motor gasoline accounts for a significant portion of total refined product demand. Jet fuel demand has increased spectacularly in the last few years—an estimated 18-percent increase in 1967 over 1966, for example.

After 10 years of surplus capacity, demand has grown to a point where construction of new facilities is required. As of January 1967, construction

of close to 500,000 barrels per day of cracking, reforming, and alkylation capacity, was underway. Nearly 40 percent of this construction was for new hydrocracking facilities and but 5 percent for replacement.

A major advantage of the hydrocracking process is its yield flexibility. When the demand for motor fuel is at a peak, the hydrocracker may be used to maximize the yield of gasoline. During winter months, it may be used to maximize the yield of heating oils.

Imports, during the last 10 years, have consistently been greater than exports. However, neither imports or exports is important in terms of total refinery shipments in dollars or in terms of new supply, defined as refinery shipments plus imports in dollars. Exports, as a percent of shipments, have run between 2 and 3 percent. Imports, as a percent of new supply, have been between 4 and 6 percent. Imports are predominantly residual oils.

FUTURE PROSPECTS

In writing of prospects for petroleum refining, a basic assumption must be made. Continuance of the Mandatory Oil Import Program, with no significant change in structure and no substantial change in import magnitudes, is postulated.

Whereas refinery capacity in 1966 was 3.83 billion barrels a year, a level of 5.1 billion barrels should be attained by 1976. Refinery consumption of raw material—crude oil and natural gas liquids—should increase from 3.7 billion barrels per year in 1966 to between 4.6 and 4.8 billion barrels in 1976. This estimate reflects a higher rate of capacity utilization in the 1970's than during the 1960's.

No dramatic shifts in refinery location are anticipated. The share of total capacity now held by the Gulf Coast may be expected to increase a little. New capacity will be added as crude oil pipelines are pushed into areas which have not enjoyed abundant crude oil supplies.

Evolutionary but not revolutionary changes in yields of major petroleum products during the next decade may be expected. Significant change will occur in both absolute and relative quantities of refinery products produced.

In 1966, yield of gasoline per barrel of crude refined was 44.6 percent. In the next 10 years yield may reach 47 percent. If electric-powered or turbine-driven automobiles were to take the place of gasoline-driven vehicles, the petroleum refining industry would be affected. These two developments are still in the offing, and are not expected to reach fruition during the next decade.

The 1956-66 spectacular growth in jet fuel production—annual rate of 12.5 percent—will

probably not be maintained, though further growth is projected.

Distillate oils, including home-heating oil and diesel fuel grew at a rate of 1.7 percent per year in the decade ending 1966. A modest growth rate is anticipated. Competition is encountered from natural gas and from electricity. A steady growth in sales of diesel fuel oil should continue.

Asphalt production should maintain a steady growth rate of between 3 and 4 percent. Much will depend upon what happens to the Federal highway program.

Since residual fuel oil commands a price which is only about two-thirds of the price of crude oil, refiners have had a strong incentive to minimize yield of this product. Refiners have reduced output, and imports have risen substantially. Air pollution abatement will limit the quantity of residual fuel oil of high sulphur content that can be sold. In all probability, low sulphur residual oil will be imported and residual oil production in U.S. refineries will continue to decline.

**Table 1.—General Statistics
Petroleum Refining—SIC 2911**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	146,025	944,332	106,898	207,609	648,278	2,119,402	14,539,055	656,788	3.269	3.123
1959.....	137,133	944,313	100,064	195,984	645,068	2,458,208	15,090,067	407,716	3.811	3.291
1960.....	134,868	935,836	97,267	192,379	635,211	2,773,430	15,505,100	455,453	4.366	3.302
1961.....	128,707	937,130	92,389	182,211	629,634	2,929,207	15,618,609	459,298	4.652	3.456
1962.....	122,946	906,561	87,804	173,348	603,032	2,965,537	15,914,146	433,315	4.918	3.479
1963.....	119,297	922,319	85,929	166,409	614,318	3,137,603	16,496,896	385,126	5.107	3.692
1964.....	113,775	905,876	81,634	162,118	605,034	3,192,212	16,802,440	384,253	5.276	3.732
1965.....	109,653	887,393	78,739	153,811	592,762	3,530,272	17,500,330	565,330	5.956	3.854
1966.....	106,548	897,277	76,279	149,925	597,525	4,082,344	18,741,859	630,655	6.832	3.985
1967.....	¹ 106,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 19,400,000	N.A.	N.A.	N.A.
1968.....	¹ 105,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 20,200,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Petroleum Refining—SIC 2911**

(Dollars in millions)

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$527	\$675	\$14,539	3.6	4.4
1959.....	467	657	15,090	3.1	4.2
1960.....	467	644	15,505	3.0	4.0
1961.....	432	703	15,619	2.8	4.3
1962.....	434	745	15,914	2.7	4.5
1963.....	483	734	16,497	2.9	4.3
1964.....	467	799	17,500	2.8	4.5
1965.....	429	940	16,802	2.4	5.1
1966.....	448	1,002	18,742	2.4	5.1
1967.....	492	1,078	² 19,435	² 2.5	² 5.3
1968.....	² 466	² 1,270	² 20,175	² 2.3	² 5.9

¹ New supply consists of shipments plus imports.

² Estimated.
N.A.=Not Available

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Petroleum Refining—SIC 2911**

United States buys from—	United States sells to—
Canada	Japan
Venezuela	Canada
Netherlands Antilles	United Kingdom
Saudi Arabia	India
Iran	Mexico
Trinidad	Brazil

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Petroleum Refining—SIC 2911**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	446	146,025	\$14,539	133	863	\$50	111	5,200	\$437	202	139,962	\$14,052
1963.....	427	119,297	16,497	130	828	53	103	4,985	578	194	113,484	15,866

Source: Bureau of the Census.

**Table 5.—Key Ratios
Petroleum Refining—SIC 2911**

Item	1958	1963
Investment per production worker.....	¹ \$67,526	\$117,498
Specialization ratio (%).....	98	98
Concentration ratios (%):		
4 firms.....	32	34
8 firms.....	55	56
20 firms.....	82	82
50 firms.....	94	95

¹1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Petroleum Refining—SIC 2911**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	119,297	South Atlantic.....	1,900
Northeast.....	18,524	East South Central.....	1,513
New Jersey.....	5,843	Mississippi.....	344
Pennsylvania.....	11,429	West South Central.....	49,907
East North Central.....	19,366	Arkansas.....	1,005
Indiana.....	6,566	Louisiana.....	10,004
Illinois.....	7,024	Oklahoma.....	5,198
Michigan.....	1,960	Texas.....	33,700
Wisconsin.....	257	Mountain.....	4,934
Ohio.....	3,559	Colorado.....	708
West North Central.....	5,481	Utah.....	880
Kansas.....	3,698	Pacific.....	17,672
		California.....	16,262

Source: Bureau of the Census.

**Table 7.—Principal Products
Petroleum Refining—SIC 2911**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Gasoline and jet fuel.....	7,825	8,152	8,413	8,375	8,469	8,328	8,632	9,169	9,927	1.27
Kerosene.....	412	*433	*472	*452	*486	656	632	727	758	1.84
Distillate fuel oil.....	2,491	2,596	2,478	2,638	2,636	2,896	2,767	2,886	3,054	1.23
Residual fuel oil.....	817	*800	*778	*738	*727	622	603	584	573	.70
Liquified petroleum gases made in refineries.....	560	684	713	728	751	957	1,012	1,161	1,253	2.24
Unfinished oils and lubricating oil base stock.....	441	423	469	495	546	526	577	559	573	1.30
Asphalt.....	285	295	314	335	365	361	385	410	435	1.53
Other finished petroleum products, inc. waxes.....	421	430	419	398	440	427	472	465	535	NC
Lubricating and similar oils.....	772	842	897	890	964	1,077	1,077	1,118	1,216	1.57
Lubricating greases.....	100	110	111	108	110	129	*134	137	145	1.45

*Standard error of estimate of 15 percent or more.
NC=Not computed.

Source: Bureau of the Census.

Pharmaceutical Preparations

SIC 2834

The pharmaceutical preparations industry is now and was in 1958 a very large industry. In 1958, the industry's shipments were \$2.6 billion and its employment was 82,000. High percentage growth from such a large base is virtually impossible. Therefore, the significant measures of growth are the absolute increases in shipments and employment. Between 1958 and 1968, the value of shipments grew by more than \$2.4 billion. In terms of employment, the industry added over 26,000 employees during the 1958-68 period.

The second major factor, which tends to understate the relative growth of shipments by the pharmaceutical preparations industry, is the fact that drug prices have declined 5 percent over the past 10 years, while the average level of wholesale prices has risen by 6 percent.

GROWTH FACTORS

It is clear that the pharmaceutical preparations industry has experienced tremendous real growth since 1958.

Introduction of new drugs is the foundation for much of the industry's growth. During the past 10 years, more than \$2.8 billion has been spent on drug research. As a result, many new preparations have been developed that are useful in treating ailments that formerly failed to respond to drug therapy. According to the Pharmaceutical Manufacturer's Association, over 75 percent of the drugs used today were not available 10 years ago. Among the important new drugs to reach the market in the last decade are:

Oral vaccine for prevention of polio
Anti-inflammatory agents such as dexamethasone and indomethacin

Vaccine for prevention of rubella (german measles)
Oral contraceptives
Analgesics, as potent as morphine, but without addiction liability
Psychotropic agents such as thiothixene and fluphenazine enanthate
Oral agents for the control of diabetes.

Aggressive promotion of ethical products and extensive advertising efforts for nonprescription drugs have been carried out by the industry in recent years. A total of \$356 million was spent in 1962 by drug companies on advertising. Based on the expansion of the industry since 1962, it is estimated that such expenditures exceeded \$500 million in 1967.

Another major growth factor for the drug industry is the passage of legislation providing for Government participation in making medical care available to disadvantaged citizens. The Medicare-Medicaid package was passed in 1965. Of the \$2.1 billion increase in the drug industry's shipments between 1958 and 1967, over \$1.1 billion occurred after 1964.

Rising health standards, as a result of educational efforts by Government, the drug industry, and other organizations, have also been a major stimulus. This trend is reflected by the rapidly spreading coverage of the population by health insurance and rising per capita expenditures on medical care and drugs.

The 50 percent increase in per capita personal income over the past decade also has provided an impetus to the domestic drug market. More families are getting more money to take care of their health needs.

To some extent, the growth can be explained by the growth of the population. Between 1960 and 1966, the population grew by 9 percent. More important was the 11 percent gain in the segment

of population over 65, whose drug needs tend to be greater and more frequent than those of lower age groups.

The rapidly expanding demand for drugs abroad has been a boon to the U.S. pharmaceutical preparations industry. While exports have been fairly stable, the U.S. investment in overseas facilities for producing drugs has risen sharply.

FUTURE PROSPECTS

Prospects for continuing large-scale growth of the pharmaceutical preparations industry are excellent.

A 25-percent increase by 1980, in persons 65 and over portends further growth in demand. If major breakthroughs in life-extending therapy occur, this gain could be even greater.

Personal income will continue to rise steadily and more families will become able to afford proper medical care.

The Medicare and Medicaid programs will probably gain much wider acceptance, thus giving the disadvantaged greater access to medical care. Expansion of national health programs overseas should push exports to grow moderately.

Intensive efforts by the drug industry to develop and introduce new products are expected to continue. There are vast opportunities, in such areas as treatment of cancer, mental illness, cardiovascular and virus diseases, to significantly expand drug sales of new products. The planned expenditure of more than half a billion dollars on drug research in 1968 reflects the drug industry's efforts to cure and prevent disease.

More widespread use of generic terminology in distribution of drugs should have dampening effect on prices, thus understating the relative growth of the industry. But the favorable prospects for real growth are undeniable.

**Table 1.—General Statistics
Pharmaceutical Preparations—SIC 2834**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	82,002	466,596	45,708	91,374	205,459	1,881,524	2,591,831	72,353	9.158	2.249
1959.....	83,722	495,887	45,563	89,378	209,081	2,015,470	2,692,187	82,770	9.640	2.332
1960.....	86,658	517,627	45,626	88,853	212,900	2,085,206	2,772,131	85,120	9.794	2.393
1961.....	87,984	549,104	46,458	91,127	225,223	2,223,734	2,926,625	86,448	9.873	2.476
1962.....	91,225	588,711	48,792	94,163	240,738	2,413,544	3,142,174	71,485	10.026	2.556
1963.....	85,084	580,638	45,937	91,671	245,993	2,595,657	3,314,323	89,286	10.552	2.688
1964.....	90,229	639,822	49,443	99,250	273,752	2,766,153	3,571,088	102,740	10.105	2.752
1965.....	94,555	701,635	51,386	102,134	299,412	3,172,824	4,049,735	122,594	10.597	2.938
1966.....	98,318	761,123	53,631	107,936	327,896	3,446,852	4,432,441	133,792	10.512	3.03.
1967.....	¹ 105,900	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 4,729,000	N.A.	N.A.	N.A.
1968.....	¹ 109,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 5,046,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not Available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Pharmaceutical Preparations—SIC 2834

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	N.A.	N.A.	\$2,344	N.A.	N.A.
1959.....	N.A.	N.A.	2,501	N.A.	N.A.
1960.....	N.A.	N.A.	2,563	N.A.	N.A.
1961.....	N.A.	N.A.	2,662	N.A.	N.A.
1962.....	N.A.	N.A.	2,856	N.A.	N.A.
1963.....	N.A.	N.A.	3,000	N.A.	N.A.
1964.....	N.A.	\$2	3,167	N.A.	(2)
1965.....	\$119	3	3,621	3	(2)
1966.....	120	3	3,955	3	(2)
1967.....	112	3	4,220	3	(2)
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Less than 0.5 percent.

³ Estimated.

N.A.=Not available

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Pharmaceutical Preparations—SIC 2834

United States buys from—

United States sells to—

United Kingdom
Japan
Canada

Canada
Mexico
Panama
Belgium
Japan
Hong Kong
South Vietnam
Germany
Venezuela

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Pharmaceutical Preparations—SIC 2834

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments
1958.....	1,114	82,002	\$2,592	796	3,902	\$69	199	8,328	\$170	119	69,772	\$2,353
1963.....	1,011	85,084	3,314	692	3,112	61	198	8,752	232	121	73,220	3,021

Source: Bureau of the Census.

Table 5.—Key Ratios
Pharmaceutical Preparations—SIC 2834

Item	1958	1963
Investment per production worker.....	¹ \$15,133	\$25,381
Specialization ratio (%).....	88	87
Concentration ratios (%):		
4 firms.....	27	22
8 firms.....	45	38
20 firms.....	73	72
50 firms.....	87	89

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Pharmaceutical Preparations—SIC 2834

Geographic area	All em-employees	Geographic area	All em-employees
Total.....	85,084	West North Central—Continued	
Northeast.....	42,516	Nebraska.....	529
New York.....	17,079	South Atlantic.....	3,708
New Jersey.....	14,362	Maryland.....	725
East North Central.....	27,965	Georgia.....	268
Indiana.....	10,507	East South Central.....	2,910
Illinois.....	8,040	West South Central.....	1,027
Ohio.....	2,702	Texas.....	943
West North Central.....	4,076	West.....	2,882
Missouri.....	2,704	Oregon.....	194
		California.....	2,536

Source: Bureau of the Census.

Table 7.—Principal Products
Pharmaceutical Preparations—SIC 2834

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Pharmaceutical preparations affecting neoplasms, endocrine system and metabolic diseases, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	259	295	331	371	N.A.
Pharmaceutical preparations acting on the central nervous system and the sense organs, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	756	826	960	1,050	N.A.
Pharmaceutical preparations acting on the cardiovascular system, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	144	155	173	185	N.A.
Pharmaceutical preparations acting on the digestive or the genito-urinary systems, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	283	285	326	352	N.A.
Pharmaceutical preparations acting on the skin, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	403	432	488	508	N.A.
Vitamin nutriment and hematinic preparations for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	160	178	198	219	N.A.
Pharmaceutical preparations affecting parasitic and infective diseases, for human use.....	N.A.	N.A.	N.A.	N.A.	N.A.	341	337	347	378	N.A.
Pharmaceutical preparations for veterinary use.....	N.A.	N.A.	N.A.	N.A.	N.A.	520	528	643	719	N.A.
Pharmaceutical preparations, excluding biological, N.E.C.....	88	96	93	98	105	110	107	140	159	1.82
	50	N.A.	N.A.	N.A.	N.A.	24	24	16	*14	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available,
N.C.=Not computed.

N.E.C.=Not elsewhere classified.

Source: Bureau of the Census.

Photographic Equipment

SIC 3861

The value of shipments of the photographic products industry, stimulated by Federal Government demand and amateur spending, jumped to a record high of \$3.6 billion in 1967 and is expected to reach almost \$4 billion in 1968. This represents an annual growth of 12.7 percent since the \$1.2 billion sales level of 1958. Employment has grown at a 4.9 percent annual rate in the past decade. Approximately 70 percent of the industry's output is produced in New York, the home of leading companies in the industry.

GROWTH FACTORS

Technological progress in the photographic equipment industry has been enormous. The development of high-quality automatic features and other techniques of simplification have contributed significantly to the increasing use of cameras of all varieties. The overwhelming trend is to simplification of the manual operations of loading, winding, and focusing. Developing high-quality, low-price cameras is the goal of the manufacturer. Included in today's inexpensive models are features such as automatic eye exposure control, rotating flashcube, and film cartridge. Introduction of popular, simplified, mass market cameras has stimulated film sales. The development of color film and more highly sensitive black and white films gives the photographer higher quality results and greater satisfaction in his work or hobby.

Improved film processing techniques and increased capacity to cope with peak workloads on Monday and Tuesday, as well as post-holiday periods, have led to increased consumer satisfaction.

Progress in aerospace, medicine and education,

where information gathering and dissemination are essential, has created a need for increased use of photographic techniques. Although accounting for a small proportion of demand for photographic products, these scientific and education fields are undoubtedly those of greatest potential growth.

Information duplication and storage requirements of business and education lead to greater demands for photocopy, microfilming, blueprinting, vandyke, and white printing equipment. Phenomenal growth has marked this segment of the industry. Since its infancy in 1958, sales of photocopy equipment have been growing at an average annual rate of 30 percent. The trend in copying equipment is toward more of the smaller desktop copiers and automated peripheral equipment such as collating and sorting devices to reduce handling time.

Farther into the future are selective or programmed copying and color copying. Through programming, the operator will be able to reproduce selected information from a document in a predetermined place on the copy. Color copying will have major applications in consumer photo reproductions and in the printing industry. Microcopy, the reproduction of textual matter and drawings in reduced form; graphic arts, the use of photographic methods in printing and publishing; and X-ray are rapidly expanding applications of the photographic principle.

X-ray film now accounts for over 12 percent of all sensitized goods sales primarily because of the medical profession's increasing use of this diagnostic tool.

The development of new and improved equipment, film and processing techniques has made products and services available to the amateur and professional photographers that could not be

obtained in the past. Increasing disposable personal income and leisure time, the changing age composition of the population, and marketing techniques have also contributed significantly to the growth of this industry.

The amateur market, which accounts for one-third of photographic product sales, benefits primarily from the rise in personal consumption expenditures. The steady expansion in personal income and leisure time also adds to increased attendance at the theater and to part-time education courses. These indirectly support demand for motion picture equipment and film and audiovisual or nontheatrical motion picture supplies. Graphic arts, the use of photographic methods in printing and publishing, might also be said to benefit from man's desire to absorb more and more information for education and entertainment.

A larger portion of the population is reaching the 20-34 age group. Family formation is most prevalent in this group and demand for amateur equipment profits from this change in the age composition of the population.

Effective promotion is expected to continue bringing mass-market products to the attention of a receptive public. Major advertising campaigns have been launched to promote nationwide picturetaking.

Federal Government expenditure supports the growth of photographic product use in a number of interesting ways. Aerial reconnaissance is the chief military and space use of photographic equipment. The entire world is being photographed every day in black and white and eventually it will all be photographed in color. Aside from this, there are many civilian uses of aerial photography such as crop studies, flood control, meteorology, map making and urban planning. Large amounts of film may also be used in the future for marine reconnaissance. Only small areas can be photo-

graphed at a time underwater because of low visibility.

In the audiovisual market, the demand for nontheatrical motion picture film and equipment from business, industry, education and Government, has been sustained by the availability of Federal Government funds. This is particularly true in education where sales of motion and still picture projectors to schools and colleges more than tripled in the past 5 years.

Exports are an important factor to the industry with approximately 10 percent of its output sold abroad. Major foreign markets are Canada, Japan, United Kingdom, and West Germany. Where protective barriers have stiffened in foreign countries, U.S. firms have often established foreign subsidiaries and have intensified their overseas sales promotions.

Imports have accounted for just above 5 percent of apparent domestic consumption for the past 5 years and this trend is expected to continue through 1968. The competitiveness of the domestic industry is expected to minimize any adverse effects of the Kennedy Round in the domestic market. Major competing countries are Japan, Germany and Belgium, with the most significant competition in fine cameras valued at more than \$100.

FUTURE PROSPECTS

The next few years should be bright ones for the photographic equipment industry. Continued technological development and growing demand factors are expected to sustain an 8-10 percent annual expansion in the market for these products. The most rapidly expanding segment, photocopying equipment, has been growing at an average annual rate of 30 percent. Aerial reconnaissance will grow at a 15 percent annual rate, the audiovisual market should expand at 10 percent annually, and the amateur market should grow 7.5 percent a year in the next 5 years.

Table 1.—General Statistics
Photographic Equipment—SIC 3861

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	60,262	368,970	38,542	74,256	201,597	788,750	1,204,905	46,770	3.913	2.715
1959.....	56,099	376,926	35,242	70,648	199,889	876,785	1,318,009	47,089	4.386	2,829
1960.....	62,420	418,832	38,872	76,500	218,966	978,911	1,466,983	60,000	4.471	2,862
1961.....	61,226	427,821	37,020	72,929	217,795	987,015	1,517,764	49,250	4.532	2,986
1962.....	59,429	439,998	35,582	70,612	223,000	1,098,113	1,635,950	57,187	4.924	3,158
1963.....	64,937	498,828	39,248	77,753	251,566	1,270,132	1,851,213	78,626	5.049	3,235
1964.....	66,606	532,715	41,006	81,751	272,220	1,485,453	2,091,180	98,427	5.457	3,330
1965.....	70,538	599,823	45,364	91,886	313,491	1,773,198	2,552,774	98,872	5.656	3,412
1966.....	84,275	710,944	55,344	109,190	377,346	2,281,987	3,285,736	148,379	6.047	3,456
1967.....	¹ 89,330	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,640,000	N.A.	N.A.	N.A.
1968.....	¹ 93,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,960,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Photographic Equipment—SIC 3861

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$86	\$47	\$1,061	8.1	4.3
1959.....	93	61	1,153	8.1	5.0
1960.....	109	67	1,206	9.0	5.3
1961.....	122	73	1,250	9.7	5.5
1962.....	129	95	1,346	9.6	6.6
1963.....	155	89	1,631	9.5	5.2
1964.....	184	105	1,906	9.6	5.2
1965.....	229	113	2,296	10.0	4.7
1966.....	277	131	2,831	9.8	4.4
1967.....	313	145	² 3,200	² 9.8	² 4.3
1968.....	² 350	² 170	² 3,600	² 9.7	² 4.5

¹ New supply consists of shipments plus imports.
² Estimated.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Photographic Equipment—SIC 3861

United States buys from—	United States sells to—
Japan West Germany Belgium	Canada Japan United Kingdom West Germany

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Photographic Equipment—SIC 3861

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	480	60,262	\$1,205	321	1,844	\$35	99	4,276	\$91	60	54,142	\$1,080
1963.....	538	64,937	1,851	351	1,811	39	119	5,268	117	68	57,858	1,695

Source: Bureau of the Census.

Table 5.—Key Ratios
Photographic Equipment—SIC 3861

Item	1958	1963
Investment per production worker.....	¹ \$10,941	\$20,489
Specialization ratio (%).....	94	95
Concentration ratios (%):		
4 firms.....	65	63
8 firms.....	74	76
20 firms.....	85	86
50 firms.....	93	93

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Photographic Equipment—SIC 3861

Geographic area	All employees	Geographic area	All employees
Total.....	64,937	East North Central—Con.	
New England.....	5,335	Wisconsin.....	280
Massachusetts.....	5,017	Ohio.....	319
Middle Atlantic.....	43,465	West North Central.....	1,030
New York.....	39,401	Missouri.....	200
New Jersey.....	3,652	South.....	1,518
Pennsylvania.....	412	Virginia.....	193
East North Central.....	9,688	Mountain.....	170
Illinois.....	7,787	Pacific.....	3,731

Source: Bureau of the Census.

Table 7.—Principal Products
Photographic Equipment—SIC 3861
(In millions of dollars)

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Still picture equipment.....	179	N.A.	160	159	149	224	282	340	454	2.53
Photocopying, microfilming, blueprinting, Vandyke, and White Printing Equipment.....	58	76	86	90	145	203	290	387	549	9.53
Motion picture equipment.....	148	145	151	136	128	128	144	179	206	1.39
Photographic sensitized film and plates.....	396	441	479	511	546	605	677	786	960	2.43
Sensitized photographic paper and cloth, silver halide type.....	124	146	156	167	184	191	199	212	236	1.90
Sensitized photographic paper and cloth, other than silver halide type.....	82	98	113	119	121	128	135	165	196	2.38
Prepared photographic chemicals.....	36	43	46	51	70	74	101	132	153	4.26
Photographic equipment, N.S.K.....	38	N.A.	N.A.	N.A.	N.A.	78	77	94	*77	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.S.K.=Not specified by kind.

N.C.=Not computed.

Source: Bureau of the Census.

Plastics Materials and Resins

SIC 2821

Shipments of the plastics materials industry have about doubled during the last 10 years to almost \$3.9 billion, while employment has increased nearly 50 percent to more than 70,000. Establishments are located throughout most of the major industrialized areas of the United States; those large volume plastics heavily dependent upon petroleum derivatives tend to be located near refineries, while the lower volume materials tend to be located near markets.

GROWTH FACTORS

Plastics materials have found markets in a large number of diverse industries. Among the more important consumers of plastic materials are: industrial products, packaging and shipping containers, construction products, housewares, furniture, automotive products, electronic components, toys, adhesives, paints and protective coatings, and plywood.

Plastics materials are man-made products developed largely during the past few decades. They have gained markets primarily by displacing other materials. The rapid growth of this industry is due to several factors which occurred during the same time period. Plastics materials are generally organic polymers. The availability of new, large sources of petroleum, coupled with improved technology in obtaining chemicals from petroleum, led to many new, inexpensive chemical materials which could be made into plastics. While the new materials were becoming available, a large amount of research and development work led to the discovery of many new polymers with interesting and useful properties.

The properties of the plastics materials, and hence of the end products can be modified significantly to suit the needs of consumers—a

factor lacking in many other commodities. Finally, the rapid growth of the economy, with increasing demand for all types of goods and services, created an economic climate favorable to the displacement of other materials by plastics and to the development of new products made possible by the unique characteristics of particular plastics.

Development of new plastics materials has been accelerating. The first commercial plastic was created in 1868; by 1938, about 16 commercial plastics had been developed. World War II led to renewed interest because of material shortages, and in the 20-year period from 1939 to 1958, another 15 commercial plastics were introduced. During the past 10 years, an additional 15 commercial plastics have been made available, each with distinctive properties and suitable for conversion into useful end products.

New plastics materials are usually introduced into the market at relatively high prices. As volume increases and the economies of scale are realized, prices are normally reduced. This factor, along with overcapacity in certain types of large-volume plastics, has resulted in generally declining prices; the wholesale price index for plastics materials declined from 101 in 1958 to 83 in 1968. This decrease in prices has contributed to the increased acceptance and use.

While the amount of plastics materials finding their way into military uses is not known, it is believed to be significant and growing. Plastics are consumed by the military largely in the form of products, and as in the civilian economy, packaging has been one of the most successful uses. In addition to direct savings in packaging costs, plastics materials provide many indirect savings in the form of much lower in-transit damage and through moisture, fungus and insect

resistance. The improved strength and light weight of many plastics materials make them especially promising for Air Force and Navy use. The Navy is already using boats made largely from reinforced plastics and is working on ship hulls and weather shields for gun mounts made of plastics. The Air Force is working on an all plastics-composite plane that would be up to 50 percent lighter than a craft made of other materials. Even if only some of the experimental projects become standard equipment, military usage of plastics materials should grow rapidly in the future.

Exports of plastics materials, which currently amount to over \$500 million annually, are growing. The value of exports has more than doubled during the past 10 years despite some comparatively high tariff rates in many major consuming countries. World capacity to produce

plastics materials is also growing rapidly, but the scheduled reduction of foreign tariff, coupled with rapidly rising world demand, should insure a favorable future export market.

FUTURE PROSPECTS

Because of the many potential large-volume uses for plastics, the future annual growth is expected to be among the highest of any industry, with some sources expecting 15 percent annual growth. Even on the most conservative assumption, the plastics materials industry should expand rapidly over the next decade. The future for most of the plastics-using industries is very favorable. In addition, the ability to replace other more expensive materials and the development of new plastics materials should combine to insure a continued increase.

Table 1.—General Statistics
Plastics Materials and Resins—SIC 2821

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	51,003	308,212	35,305	72,035	189,321	871,956	1,846,667	178,882	4.606	2.628
1959.....	54,148	344,432	37,187	77,654	211,105	1,110,661	2,236,262	132,039	5.261	2.719
1960.....	55,269	358,981	37,841	77,910	216,916	1,041,376	2,183,038	155,026	4.801	2.784
1961.....	54,457	369,264	36,985	77,712	222,061	968,510	2,124,489	157,349	4.361	2.857
1962.....	57,674	401,498	39,486	82,170	244,989	1,102,045	2,372,111	149,516	4.498	2.981
1963.....	61,366	437,566	41,446	86,134	264,499	1,202,349	2,571,492	137,781	4.546	3.071
1964.....	62,569	461,543	41,979	88,884	278,208	1,347,027	2,773,869	209,550	4.842	3.130
1965.....	66,035	498,893	44,681	93,647	301,779	1,479,679	3,117,739	219,807	4.903	3.223
1966.....	70,763	556,894	47,619	99,976	328,700	1,702,822	3,532,863	300,008	5.180	3.288
1967.....	¹ 72,000	¹ 590,000	N.A.	N.A.	N.A.	N.A.	¹ 3,650,000	N.A.	N.A.	N.A.
1968.....	¹ 73,000	¹ 634,000	N.A.	N.A.	N.A.	N.A.	¹ 3,880,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Plastics Materials—SIC 2821

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$220	\$7	\$1,972	11.2	(2)
1959.....	271	9	2,426	11.2	(2)
1960.....	297	10	2,416	12.3	(2)
1961.....	293	7	2,461	11.9	(2)
1962.....	305	12	2,698	11.3	(2)
1963.....	309	14	2,780	11.1	(2)
1964.....	390	31	3,000	13.0	1.0
1965.....	425	40	3,478	12.2	1.1
1966.....	473	59	3,750	12.6	1.5
1967.....	473	61	³ 3,800	³ 12.4	³ 1.6
1968.....	³ 525	³ 80	³ 4,100	³ 12.8	³ 1.9

¹ New supply consists of shipments plus imports.
² Less than 0.5 percent.
³ Estimated.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Plastic Materials and Resins—SIC 2821

United States buys from—	United States sells to—
United Kingdom West Germany Japan	Canada United Kingdom Netherlands Belgium West Germany Japan Australia

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Plastics Materials and Resins—SIC 2821

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	349	51,003	\$1,847	153	1,094	\$50	115	5,189	\$224	81	44,720	\$1,572
1963.....	509	61,366	\$2,571	253	1,869	106	162	7,305	397	94	52,192	2,069

Source: Bureau of the Census.

Table 5.—Key Ratios
Plastics Materials and Resins—SIC 2821

Item	1958	1963
Investment per production worker ¹	\$29,398	\$46,010
Specialization ratio(%).....	86	84
Concentration ratios (%):		
4 firms.....	40	35
8 firms.....	56	49
20 firms.....	79	69
50 firms.....	92	87

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Plastics Materials and Resins—SIC 2821

Geographic area	All em- ployees	Geographic area	All ems plovee-
Total.....	61,366	East North Central.....	10,571
New England.....	8,477	Illinois.....	1,214
Massachusetts.....	5,438	Wisconsin.....	600
Middle Atlantic.....	20,694	Ohio.....	3,742
New York.....	5,013	West North Central.....	2,491
New Jersey.....	6,304	South and West.....	19,133
Pennsylvania.....	9,377	North Carolina.....	955
		Alabama.....	343
		Texas.....	1,948
		Washington.....	271

Source: Bureau of the Census.

Table 7.—Principal Products
Plastics Materials and Resins—SIC 2821

[Dollars in Millions]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Regenerated cellulosic products, excluding rayon.....	302	334	345	334	325	328	336	330	330	1.09
Thermoplastic resins (excluding resins for protective coatings).....	N.A.	N.A.	N.A.	N.A.	N.A.	1,312	1,422	1,747	2,058	N.A.
Thermosetting resins (excluding resins for protective coatings).....	N.A.	N.A.	N.A.	N.A.	N.A.	420	458	466	525	N.A.
Synthetic resin adhesives, from resins manufactured in same establishment.....	N.A.	N.A.	N.A.	N.A.	N.A.	28	28	33	45	N.A.
Unsupported plastic film, sheets, rods, tubes.....	N.A.	N.A.	N.A.	N.A.	N.A.	688	771	909	1,108	N.A.
Synthetic resins for protective coatings.....	N.A.	N.A.	N.A.	N.A.	N.A.	272	299	317	351	N.A.
Custom compounded purchased resins.....	N.A.	N.A.	N.A.	N.A.	N.A.	185	197	290	321	N.A.
Plastics and resin materials, N.E.C.....	N.A.	N.A.	N.A.	N.A.	N.A.	60	67	60	61	N.A.
Plastics materials and resins, N.S.K.....	1	N.A.	N.A.	N.A.	N.A.	9	10	¹ 13	¹ 11	N.C.

¹ Standard error of estimate of 15 percent or more.
N.C.=Not computed.
N.A.=Not available.

N.S.K.=Not specified by kind.
N.E.C.=Not elsewhere classified.

Source: Bureau of the Census.

Plastics Products

SIC 3079

The plastics products industry emerged from virtual obscurity prior to World War II into a large and one of the fastest growing industries in the United States. At the current rate of growth, shipments of this industry will soon be 100 times as large as they were in 1939. During the past 10 years, shipments have increased over 200 percent to more than \$5.8 billion, while employment has grown 120 percent to over 250,000. Plants are located throughout the United States, with about half in the Middle Atlantic and East North Central States. Plants tend to locate near markets, primarily other manufacturing establishments.

Establishments in the plastics industry are primarily engaged in the production of consumer and industrial items made from a large number of plastics materials. Plastics materials are man-made products developed largely during the past few decades. Plastics materials have gained markets usually by displacing other materials, such as rubber, leather, metals, wood, concrete, glass, paper, and textiles, because of their lower cost, superior properties, and the fact that they can be custom made to suit specific uses. In addition to the large number of plastics products, they are widely used in the manufacture of paints, adhesives, textile and paper coating, and plywood. The plastics products industry includes mostly items where the plastics retain their identity in the product rather than being used as a constituent materials, as in paints or coatings.

GROWTH FACTORS

There are literally thousands of plastics products manufactured. Most are made by one or more of a few basic processes, namely: (1) molding, (2) calendering, (3) casting, (4) extruding,

and (5) laminating. The capital required to set up a processing operation is relatively small, and this accounts for the large number of plastics products manufacturers (over 5,000). In addition, many companies engaged in the manufacture of other products have added plastics processing units, often to provide component parts for their products.

The relative ease of entry into this industry—technology and skills are necessary but are not formidable obstacles—has contributed to the growth of plastics products. The greatest difficulty facing a small plastics products manufacturer is in marketing. Research and development may suggest that a product can be made successfully from plastics materials, but it is extremely difficult to break into an established distribution system. Consequently, there is a tendency for companies which have the knowledge of, or access to, the distribution system to merge with a plastics products manufacturer or to begin production of plastics products themselves.

The combination of relatively low cost materials and the ability to tailor the material to a specific need, is probably the most important reason for the growth of plastics products. In packaging, for example, certain plastics have excellent protective qualities coupled with good clarity; other plastics have low absorption qualities and help retain liquids, like the juices in meat; other plastics are poor heat conductors and help preserve products, particularly those requiring refrigeration; other plastics are shock resistant and provide excellent protection for shipping delicate instruments.

Products classified specifically as plastics products exports have been growing and are approaching \$100 million annually. The total amount of

plastics products exports is not precisely known, however, because some products are classified under their functional use, e.g. footwear, rather than under their constituent materials. Plastics products are usually one of the earlier industries established in developing countries; consequently, the growth of plastics products exports will probably trail the growth of plastics materials exports.

FUTURE PROSPECTS

One area of growth for plastics products where the future potential is great is building materials. Overall, the growth of plastics in construction

has averaged 15 percent annually in recent years. Building panels, floor and wall coverings, and plumbing fixtures and parts are already made of plastics to a significant extent. Prefabricated rooms made largely of plastics offer possibilities for less expensive renovation of deteriorated buildings in urban areas.

Other areas where rapid future growth of plastics products are probable include: furniture and components; automotive and transportation products, (where plastics now have a market of 50 pounds per new car and where 100 pounds per new car is anticipated in a few years); electronic components; and household appliances and housewares.

**Table 1.—General Statistics
Plastics Products—SIC 3079**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	116,308	511,207	91,988	183,253	348,892	928,950	1,867,877	77,193	2.663	1.904
1959.....	129,523	583,799	103,149	209,492	401,550	1,093,738	2,217,655	86,730	2.724	1.917
1960.....	134,024	627,526	106,241	216,218	423,998	1,147,939	2,303,178	105,716	2.707	1.961
1961.....	136,811	665,080	107,965	221,135	446,751	1,254,266	2,473,155	112,901	2.808	2.020
1962.....	153,796	765,068	123,380	252,194	517,667	1,466,695	2,819,573	143,555	2.833	2.053
1963.....	166,315	837,572	134,327	271,976	579,990	1,660,882	3,165,440	161,094	2.864	2.133
1964.....	178,817	935,282	144,429	299,195	643,029	1,853,484	3,505,425	182,179	2.882	2.149
1965.....	205,274	1,086,156	166,559	337,439	748,598	2,213,632	4,120,405	250,765	2.957	2.218
1966.....	224,017	1,221,601	182,072	377,415	844,014	2,515,595	4,658,290	328,718	2.981	2.236
1967.....	¹ 234,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 4,990,000	N.A.	N.A.	N.A.
1968.....	¹ 253,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 5,750,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3079.

**Table 4.—Number of Employees by Size of Establishment
Plastics Products—SIC 3079**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	3,222	116,308	\$1,868	2,079	13,086	\$209	894	39,665	\$622	249	63,557	\$1,036
1963.....	4,334	166,315	3,165	2,660	16,320	293	1,277	56,681	1,045	397	93,314	1,827

Source: Bureau of the Census.

Table 5.—Key Ratios
Plastics Products—SIC 3079

Item	1958	1963
Investment per production worker	¹ \$5,664	\$9,510
Specialization ratio (%)	N.A.	92
Concentration ratios (%):		
4 firms	N.A.	8
8 firms	N.A.	21
20 firms	N.A.	20
50 firms	N.A.	31

¹ 1957.

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Plastics Products—SIC 3079

Geographic area	All employees	Geographic area	All employees
Total	166,315	West North Central—Continued	
New England	21,869	Kansas	415
Maine	1,056	South Atlantic	11,508
New Hampshire	1,564	Delaware	1,549
Vermont	11,972	Maryland	2,640
Connecticut	4,555	Virginia	2,134
Middle Atlantic	45,015	South Carolina	1,838
New York	19,160	Georgia	615
New Jersey	16,793	Florida	1,149
Pennsylvania	9,062	East South Central	4,690
East North Central	55,468	Mississippi	628
Indiana	7,621	West South Central	4,260
Illinois	19,665	Louisiana	189
Michigan	8,108	Texas	3,053
Wisconsin	3,594	West	15,086
Ohio	16,480	Colorado	195
West North Central	8,419	Arizona	255
Minnesota	2,425	Washington	359
Iowa	1,711	Oregon	166
Missouri	3,473	California	13,894

Source: Bureau of the Census.

Table 7.—Principal Products
Plastics Products—SIC 3079

(Dollars in Millions)

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Foamed plastic products	54	91	112	170	188	261	305	354	398	7.36
Laminated sheets, rods and tubes	163	200	211	219	253	244	265	301	349	2.14
Packaging and shipping containers, plastics	N.A.	N.A.	N.A.	N.A.	N.A.	442	488	539	615	N.A.
Industrial plastics products	N.A.	N.A.	N.A.	N.A.	N.A.	833	891	1,126	1,347	N.A.
Construction plastics products	N.A.	N.A.	N.A.	N.A.	N.A.	284	295	330	361	N.A.
Plastics dinnerware, tableware, and kitchenware	N.A.	N.A.	N.A.	N.A.	N.A.	148	165	164	163	N.A.
Consumer and commercial plastics products, N.E.C.	N.A.	N.A.	N.A.	N.A.	N.A.	457	512	637	713	N.A.
Plastics products, N.E.C. N.S.K.	79	N.A.	N.A.	N.A.	N.A.	138	123	137	127	N.C.
Unsupported plastic film, sheets, rods, tubes, from resins manufactured from purchased materials	N.A.	N.A.	N.A.	N.A.	N.A.	588	771	909	1,108	N.A.

N.A.=Not available.

N.C.=Not computed.

N.E.C.=Not elsewhere classified.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Primary Aluminum

Sic 3334

Economic growth in the primary aluminum industry has been highlighted by an increase in the value of shipments estimated at 110 percent between 1958-68. During the same period, total employment increased by an estimated 36 percent. About 60 percent of the industry is located in the Western and West South Central States.

GROWTH FACTORS

Major factors accounting for this significant growth rate include: technological progress based on intensive research and development programs, resulting in a high rate of new product development, together with substitution of aluminum for other basic materials; aggressive marketing techniques; and price stability.

Primary aluminum is produced by the electrolysis of a solution of alumina in molten cryolite. The basic production unit is the potline, consisting of a number of electrolytic cells or pots connected in series. The first commercial pots installed in the United States operated at about 1,700 amperes, with a production of about 25 pounds of aluminum per pot per day, with power consumption of 13 to 14 kw.-hr. (kilowatt-hours) per pound.

Today, the largest pots are about 100 times as large, operate at approximately 150,000 amperes, and use less than 7 kw.-hr. per pound. Capacity per pot per day has increased from 25 pounds to over a ton. Plant capacities have also increased.

The larger cell and plant capacities permit a higher degree of mechanization and more efficient use of labor, with resulting economies in labor costs.

Significant technological developments in aluminum reduction plants since World War II include

the increasing size of the individual pots, increasing size of plants, improvements in pot linings and anodes, increasing mechanization, production of alloy ingot, and transfer of molten metal directly to consuming plants. Extensive research and development programs for improvements in technology are continuing.

The number of producers has increased from just one prior to World War II to six in 1958 and eight in 1968, and additional producers are beginning plant construction or planning to enter the industry. Much of the primary aluminum produced is used by the producing company or by associated companies to make semifabricated or mill products.

Major mill products are sheet, plate, foil, rod, bar, wire, cable, extruded shapes, tube, powder, and forgings. Independent companies making semifabricated products or castings have also greatly increased in number. All this growing competition has been a factor in the growth of the industry.

New product development has characterized the aluminum industry. The market for primary aluminum is dependent upon the demand for finished products which use aluminum as a major material or in components. Those industries which represent major markets for aluminum include building and construction, transportation, consumer durables, electrical, machinery and equipment, and containers and packaging.

All are growth industries, and all are characterized by potentials for new product development. Some specific end-uses are in roofing and siding, doors, windows, screens, awnings and canopies, store fronts, gutters and downspouts, curtain building wall, heating and ventilating equipment, builders hardware, passenger car components,

mobile homes, trucks, buses, trailers, aircraft, boats and outboard motors, refrigerators and air conditioning, appliances, furniture, cooking utensils, power transmission and distribution, irrigation pipe, foil packaging and containers, cans, and shipping containers.

Defense uses have increased, with significant amounts in aircraft, missiles, aerospace, ammunition, tanks, and vehicles. Aluminum is important in the development of an increased air-transportable capability.

R. & D. programs to increase the consumption of aluminum have been successful in the development of new alloys, new processes, and new products. The industry has also taken the initiative in developing and promoting many new end-uses for aluminum.

Aggressive education and promotional programs have been undertaken by the producers of primary aluminum to expand present markets and develop new ones. These programs are sponsored and run by individual companies and by trade associations. Major companies advertise extensively in the principal mass media, promoting consumer end products made with aluminum. Consumption has also been influenced by the development of an active and close customer service relationship.

Price stability has contributed to the expansion in markets for aluminum. In 1968 the average price of primary aluminum and mill products was about the same as in 1958.

Contributing to this price stability and influencing the growth of the industry has been an ample world supply of the basic raw material, bauxite.

Most bauxite used in the United States is imported, and major new reserves are being developed. The production of primary aluminum requires large amounts of electric power at reasonable rates. Hydropower has supplied much of this in the past, with gas and coal powerplants supplying the remainder. The increasing efficiency of powerplants using coal and the ready availability of coal has led to an increase in recent years of aluminum plants using such power.

FUTURE PROSPECTS

The outlook for continuing growth in the markets for and consumption of primary aluminum in the immediate future is highly favorable. R. & D. programs sponsored by both the producers of primary aluminum and its users are continuing. New alloys, processes, and products should continue to be developed. It is expected that this industry will continue to grow at a rate substantially higher than that for the economy as a whole.

A significant factor in the future growth of this industry is the prospect of a continued relatively stable level of prices, which should stimulate the increasing use of this metal. The availability of bauxite and power at a reasonable cost seems assured, at least for the near future.

For the long term, there is also the possibility of nuclear power. The primary aluminum industry requires very substantial amounts of capital for the necessary equipment. Future growth will depend to a significant degree on the availability of needed capital at a reasonable cost.

**Table 1.—General Statistics
Primary Aluminum—SIC 3334**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-Hours (1,000)	Wages (\$1,000)					
1958.....	17,381	\$111,588	13,428	27,738	\$82,750	\$383,836	\$808,822	\$142,293	\$4.639	\$2.983
1959.....	17,997	122,606	14,362	30,022	92,622	453,285	953,775	38,534	4.959	3.085
1960.....	17,848	123,956	14,120	29,133	92,498	472,711	921,215	26,647	5.110	3.175
1961.....	16,201	117,151	12,651	26,087	86,170	454,206	953,894	19,258	5.271	3.303
1962.....	17,221	125,584	13,677	27,924	94,629	471,980	1,014,921	10,798	4.988	3.389
1963.....	18,133	134,116	14,459	29,487	101,399	499,576	1,089,977	62,172	4.927	3.439
1964.....	20,332	146,576	16,701	32,048	111,864	549,205	1,191,409	51,804	4.910	3.491
1965.....	20,665	156,550	16,774	33,544	119,868	634,865	1,364,717	60,470	5.296	3.573
1966.....	21,141	168,119	17,051	34,715	127,411	725,057	1,496,221	65,753	5.691	3.670
1967.....	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.	1,600,000	N. A.	N. A.	N. A.
1968.....	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.	1,700,000	N. A.	N. A.	N. A.

¹ Estimated.
N.A. = Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Primary Aluminum—SIC 3334

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$24	\$117	\$809	3.0	12.6
1959.....	54	111	954	5.7	10.4
1960.....	128	76	921	13.9	7.6
1961.....	58	91	954	6.1	8.7
1962.....	67	130	1,014	6.6	11.3
1963.....	72	163	1,090	6.6	13.0
1964.....	92	163	1,191	7.7	12.0
1965.....	93	218	1,365	6.8	13.8
1966.....	90	218	1,496	6.0	12.7
1967.....	100	195	² 1,600	² 6.2	² 10.9
1968.....	² 80	² 300	² 1,700	² 4.7	² 15.0

¹ New supply consists of shipments plus imports. Data are not adjusted for shipments to, and deliveries from stockpiles.

² Estimated.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Primary Aluminum—SIC 3334

United States buys from—	United States sells to—
Canada Norway Ghana	Belgium Japan France

Source: Bureau of the Census.

Table 4-a.—Number of Employees by Size of Establishment
Primary Aluminum—SIC 3334

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	20	17,381	\$809				1	(1)	(1)	19	17,381	\$809
1963.....	23	18,133	1,090	1	(1)	(1)	1	(1)	(1)	21	18,133	1,090

¹ Included in total.

Source: Bureau of the Census.

Table 4b—NUMBER OF ESTABLISHMENTS BY CAPACITY SIZE
Primary Aluminum—3334

Year	Total		Under 100,000 tons		100,000-199,999 tons		200,000 tons and over	
	Number	Total capacity	Number	Total capacity	Number	Total capacity	Number	Total capacity
1958.....	20	2,194,250	10	674,150	9	1,272,600	1	247,500
1963.....	23	2,511,250	11	690,150	11	1,573,600	1	247,500
1967.....	24	3,321,000	4	262,000	16	2,132,000	4	927,000

Source: BDSA.

Table 5.—Key Ratios
Primary Aluminum—SIC 3334

Item	1958	1963
Investment per employee.....	¹ \$48,530	\$88,957
Specialization ratio (%).....	100	100
Concentration ratios (%):		
4 firms.....	D.	D.
8 firms.....	100	100
20 firms.....	N.A.	N.A.
50 firms.....	N.A.	N.A.

¹ 1957.

D.=Disclosure.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Primary Aluminum—SIC 3334

Geographic area	All employees	Geographic area	All employees
Total.....	18,133	West.....	4,765
West South Central.....	6,426	All other divisions.....	6,932

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3334.

Radio; Communications Equipment

SIC 3662

The radio and television transmitting signaling and detection equipment and apparatus industry is truly a growth industry. Shipments and employment increased by 212 percent and 178 percent respectively between 1958 and 1968. The growth of output was widely distributed among the industrial states with technological developments emanating from research communities surrounding the larger cities and universities.

GROWTH FACTORS

Technological development is fundamental to the growth of this industry. Most of its products were unknown 50 years ago and only 20 years ago, with the advent of television, was the potential scope of the industry becoming apparent. Development of industrial, military, and consumer applications broadened the scope of potential demand for communications equipment and serves as a major factor in the industry's growth.

Widespread consumer use of radios and television sets has stimulated the growth of broadcasting equipment. In the 1920's and 1930's, the radio became a household commonplace. In the 1950's and 1960's, monochrome and color television sets followed the radio pattern. Through the FM and FM stereo, radio has continued its development to higher levels of consumer satisfaction. The number of monochrome television sets in use increased 100 percent between 1958 and 1967.

Radios in use increased 64 percent during that period. Nearly 13 million color television sets were in operation in 1967. Whereas 67 percent

of all households owned television sets in June 1955, 94 percent owned them in June 1967.

The number of commercial broadcast stations increased 57 percent between 1958 and 1967. The necessity to meet new station needs and the needs for increased power and more sophisticated equipment of existing stations, has placed growing demands on the supply of transmitting equipment.

The growth in output of commercial broadcast equipment is currently a small part in the growth in this industry. Of more importance quantitatively is the growth in output of sophisticated military, space, guidance, search and detection, and navigational devices.

The industry's output includes navigation systems for the airways; railway signals and control equipment; space vehicle navigation equipment; satellite communications equipment; radar and sonar devices; and advanced electronic scientific equipment. Not all of the applications are in the Government or public service fields. Commercial applications, medical and scientific applications, and basic research contribute to the growing demand.

Another significant factor in growth of this and other scientifically oriented industries is the personal drive operating in a largely free and open society. A high level of education and educational opportunity coupled with a system of rewards reflected in salary, professional recognition, patent opportunities, etc., act as spurs to technical development.

A pluralistic combination of private, university, and Federal Government research with a cross-fertilization of ideas between laboratories and production lines is a nearly ideal system for innovation and, consequently, growth.

FUTURE PROSPECTS

U.S. Government appropriations for basic research and military and space hardware are fundamental to growth in the communications equipment industry. Whether the demands for military equipment will continue is an imponderable question of international relations. The challenge of space exploration will continue even after the lunar landings. Applications of space flight to commercial uses, such as contemplated in the Earth Resources Observational Satellites, will require transmitting, signaling and detection equipment.

Deep sea exploration will be carried on with electronic detection equipment. Traffic control devices will probably utilize the same techniques and equipment they currently employ. Weather forecasting applications have only scratched the

surface of potential applications of electronic signaling and detection devices.

Scientific research in the nature of matter, in elementary particles, and in wave theory may be the fundamental driving forces in expansion of this industry. Substantial investments of public and private funds are proposed to further the development of linear accelerators, betatrons, laser and maser equipment, and cyclotrons for research in these scientific areas.

It can confidently be expected that the technology embodied in the sophisticated products developed by this industry will spread to civilian applications. Process control devices in the oil, chemical, and steel industries point the way to applications in other industries. The utility of electronic devices has been demonstrated in many different fields, and this trend is expected to continue in the foreseeable future.

Table 1.—General Statistics
Radio; TV Communications Equipment—SIC 3662

Year	Total employment		Production workers			Value added (\$1,000)	Value ship- ments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man- hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	154,350	924,071	88,523	178,315	433,648	1,558,261	2,852,617	56,147	3.593	2.432
1959.....	187,129	1,186,871	107,901	220,684	568,945	1,831,100	3,540,848	79,484	3.218	2.578
1960.....	239,742	1,602,632	127,124	277,842	738,599	2,399,539	4,458,261	97,907	3.249	2.658
1961.....	307,660	2,162,513	149,958	326,332	915,941	3,160,576	5,682,482	112,932	3.451	2.807
1962.....	348,401	2,575,807	178,138	380,720	1,207,580	3,914,678	6,663,654	114,325	3.242	3.172
1963.....	387,384	2,840,218	205,698	419,121	1,230,671	4,327,671	7,145,600	138,734	3.517	2.936
1964.....	353,301	2,638,655	181,728	367,526	1,170,102	4,258,060	6,510,178	124,540	3.639	3.184
1965.....	352,941	2,813,931	185,654	378,723	1,179,317	4,349,141	6,861,592	147,587	3.688	3.114
1966.....	376,680	3,086,819	208,232	415,460	1,325,593	4,855,258	7,562,632	187,948	3.663	3.191
1967.....	¹ 418,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 8,700,000	N.A.	N.A.	N.A.
1968.....	¹ 428,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 8,900,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Radio; TV Communications Equipment—SIC 3662

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$185	N.A.	\$2,382	7.8	N.A.
1959.....	178	N.A.	3,070	5.8	N.A.
1960.....	191	\$22	3,250	5.9	0.7
1961.....	236	32	4,138	5.7	1.2
1962.....	327	54	4,564	7.2	1.2
1963.....	433	71	6,052	7.2	1.2
1964.....	445	87	5,994	7.4	1.4
1965.....	317	107	6,010	5.3	1.7
1966.....	356	115	6,623	5.4	1.7
1967.....	449	131	² 7,200	² 6.2	² 1.8
1968.....	² 500	² 135	² 7,800	² 6.4	² 1.7

¹ New supply consists of shipments plus imports.

² Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Radio; TV Communications Equipment—SIC 3662

United States buys from—	United States sells to—
United Kingdom European Economic Community Japan	Japan Canada United Kingdom

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Radio, TV Communications Equipment—SIC 3662

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments
1958.....	512	129,515	\$2,415	252	1,618	\$25	120	5,561	\$77	140	122,336	\$2,313
1963.....	1,132	387,384	7,146	497	3,340	54	330	15,508	256	305	368,536	6,836

Source: Bureau of the Census.

Table 5.—Key Ratios

Radio; TV Communications Equipment—SIC 3662

Item	1958	1963
Investment per production worker.....	N.A.	\$6,032
Specialization ratio (%).....	N.A.	88
Concentration ratios:		
4 firms.....	N.A.	29
8 firms.....	N.A.	45
20 firms.....	N.A.	69
50 firms.....	N.A.	84

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963

Radio; TV Communications Equipment—SIC 3662

Geographic area	All Em- ployees	Geographic area	All em- ployees
Total.....	387,384	South.....	61,598
New England.....	41,029	Virginia.....	5,100
New Hampshire.....	3,191	Florida.....	10,074
Middle Atlantic.....	127,027	Texas.....	8,843
North Central.....	58,055	Mountain.....	4,603
Michigan.....	1,973	Colorado.....	170
Nebraska.....	184	New Mexico.....	254
		Pacific.....	95,072
		Washington.....	954

Source: Bureau of the Census.

Table 7.—Principal Products

Radio; TV Communications Equipment—SIC 3662

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Commercial, industrial, and military electronic communication equipment.....	416	519	597	812	859	1,081	997	1,145	1,446	3.48
Radio and television broadcast equipment and closed circuit systems.....	76	87	73	94	143	151	168	254	353	4.62
Intercommunication equipment.....	130	168	184	164	181	166	176	197	228	1.76
Electronic navigational aids (excluding missile borne and space vehicle borne equipment).....	426	465	887	1,380	1,694	1,246	1,042	1,080	1,135	2.67
Electronic aircraft and missile control, guidance and check-out systems.....	N.A.	N.A.	N.A.	N.A.	N.A.	1,645	1,488	1,257	1,512	N.A.
Other commercial, industrial and military electronic equipment, N.E.C.....	N.A.	N.A.	N.A.	N.A.	N.A.	724	829	886	936	N.A.
Space satellite borne communication stations (complete package).....	N.A.	N.A.	N.A.	N.A.	N.A.	29	43	65	104	N.A.
Missile borne and space vehicle borne equipment.....	N.A.	N.A.	N.A.	N.A.	N.A.	979	890	824	865	N.A.
Radio, TV communications equipment, N.S.K.....	0	0	0	0	0	32	22	*16	*17	N.C.

N.C.=Not Computed.

N.A.=Not Available.

N.E.C.=Not elsewhere classified.

N.S.K.=Not specified by kind.

*Standard error of estimate of 15 percent or more.

Source: Bureau of the Census.

Radio and TV Receiving Sets

SIC 3651

The growth of the consumer electronics industry has been characterized by innovative technological improvements. The past decade has seen radio, television, and hi-fi audio products become more reliable, portable, and compact.

The near tripling of industry shipments between 1958 and 1968 is evidence of the consumer's enthusiastic acceptance of these products which were marketed in response to the affluence, mobility, and leisure time interests of postwar society.

During this timespan, employment in the industry doubled. Approximately 90 percent of total industry employment is located in the East-North-Central and Middle Atlantic areas.

GROWTH FACTORS

Since 1958, a flow of technological innovations such as the transistor and other solid-state devices from computer, military, and space research have been applied to consumer electronic products. The next decade will see the replacement of transistors and other discrete solid-state devices by Integrated Circuits (IC's).

This substitution by IC's (thumbnail-sized wafers performing complex electronic functions now handled by many transistors and other circuit elements) will result in even greater compactness and functional capability. The superior performance and efficiency of these circuits will have a significant effect on future innovative applications and product designs as well as on costs.

The continued growth of radio sales is attributable to the miniaturization and decreased costs made possible by the use of transistors. This application of transistors has opened new markets

for an industry which, in TV's wake, was presumed to be dead. The low prices and portability of these radios have attracted the emerging teen-age market, and at the same time, appealed to adults who were seeking replacement of their pre-Korean War tube radios. The penetration of these markets was spearheaded by Japanese imports, and in more recent years, imports bearing the brands of domestic manufacturers.

While transistors were at first utilized in small portables only, the last few years have witnessed a wide variety of applications in small and large models alike. Most product lines now include AM, FM, AM/FM, and clock radios. With the establishment of an FM multiplex operating standard for stereo broadcasting by the Federal Communications Commission in the mid-50's, new industry sales were generated for a new FM stereo radio market, especially in hi-fi applications. In the past four years, the increasing number of FM stations broadcasting in stereo mode has also spurred consumer purchases of AM/FM stereo car radios.

While actual production of smaller radios is limited by speaker design, further advances in the state of the art are expected to reduce the size of radios in the future. Radio sales will continue to grow steadily as consumers become aware of the greater sensitivity and performance in relation to size of radios manufactured with IC's.

Sales of TV receivers have been increasing annually since 1958. Since 1965, the value of color TV factory sales has continually been higher than black and white, with color increasing its share of the market to more than 80 percent of total TV sales.

In the past two years, small-screen, less expensive portable monochrome and color models

have been introduced and have gained enthusiastic consumer acceptance. Sales of these have increased in proportion to higher priced, larger screen units, consoles, and combination TV and stereo units.

Steadier, if less dramatic growth can be anticipated for color TV as demand levels off. Black-and-white set sales have declined under pressure from the color portables, and a moderate decline is expected to continue as color TV improves and costs are reduced. Continuing consumer interest in color television and increasing television color programming will spur the industry's continued growth.

Improvements in service and reliability of the color TVs, as transistors and IC's replace tubes and other components, will eliminate a significant deterrent to greater color sales. While break-throughs equivalent to the step-up from monochrome to color are not imminent, the refinements which will be integral to even the small-screen sets will make color TV more desirable to those consumers who have been holding back and waiting for a more perfected product.

The next decade does indeed promise new break-throughs—possibly three-dimensional TV, picture tubes that can be mounted on the wall independent of equipment consoles, personalized, small-screen sets, etc., but the reality of the near future is in greater sophistication in the tuning and color fidelity systems and a general reliability that will diminish the need for servicing.

Legislation has been proposed in Congress to require "detent" tuning (a "click" stop for every channel), now not provided for UHF channels. This proposal, if enacted, while providing greater ease of tuning, could increase the cost of TV to the consumer.

[Prices could also increase if the present and increasing flow of TV receivers and component imports were reduced by quotas or new tariff restrictions.]

The growth of consumer audio products sales has continued unabated since the mid-50's and promises to continue at an even higher pace

through the 70's. Audio equipment sales received their prime impetus from the development and successful market acceptance of stereo records and tapes, and FM stereo multiplex broadcasting. Within the past 18 months, the success of stereo cartridges and cassettes for automobile and home installations has created a brand-new market for audio equipment.

New products are introduced in the market annually as domestic and foreign manufacturers aggressively compete for the consumer's dollar. The domestic market is attractive to Japanese, German, U.K. and Scandinavian manufacturers who provide a wide and changing array of models designed to meet the needs of U.S. consumers.

FUTURE PROSPECTS

The future holds high promise for the consumer electronics industry. Continuing product improvements and portending break-throughs in consumer electronic products could provide the dramatic leaps which FM stereo multiplex, color TV and stereo records provided in earlier years.

The future market will not be limited exclusively to leisure time applications, as the strong possibility exists that the products of the future can be used for business, educational, and other purposes. Versatile, multicomponent electronic consoles, for example, may well be included in the homes of the next decade as refrigerators and other appliances are today.

Such consoles, in addition to providing entertainment, may be used by the homeowner to perform purchasing, banking, and other functions. Mergers between electronic manufacturers and home builders and the current interest of large-scale manufacturers in new town developments may be indicative of this possibility.

The continuing growth of the consumer electronic industry into the 70's then is not only related to the productivity and affluence of our society, but the growing variety of consumer applications of electronic products.

Table 1.—General Statistics
Radio and TV Receiving Sets—SIC 3651

Year	Total employment		Production workers			Value added (\$1,000)	Value shipment (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	66,505	292,664	52,047	100,487	196,565	593,953	1,548,006	13,323	3.022	1.956
1959.....	74,874	339,395	60,168	176,187	231,738	727,108	1,781,133	16,610	3.138	1.315
1960.....	71,743	340,600	56,269	108,463	222,348	694,336	1,719,337	19,594	3.123	2.050
1961.....	76,837	369,982	59,553	112,093	239,326	728,832	1,849,180	N.A.	3.045	2.135
1962.....	82,951	408,332	66,052	127,222	273,350	868,958	2,128,875	27,096	3.179	2.149
1963.....	81,264	411,924	66,538	128,463	289,287	911,954	2,254,878	30,511	3.152	2.252
1964.....	86,495	440,584	70,869	139,751	312,716	983,355	2,509,666	33,334	3.145	2.238
1965.....	100,136	535,148	83,099	166,226	393,233	1,249,412	3,207,506	58,764	3.177	2.366
1966.....	130,183	679,412	109,791	213,955	509,753	1,674,819	4,091,865	121,120	3.286	2.383
1967.....	¹ 135,000	N.A.	N.A.	N.A.	N.A.	N.A.	4,100,000	N.A.	N.A.	N.A.
1968.....	¹ 130,000	N.A.	N.A.	N.A.	N.A.	N.A.	4,350,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not Available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Radio and TV Receiving Sets²—SIC 3651
[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$74	\$21	\$1,548	4.78	1.35
1959.....	72	78	1,781	4.04	4.37
1960.....	71	87	1,719	4.13	5.06
1961.....	80	121	1,849	4.32	6.54
1962.....	54	165	2,129	2.53	7.75
1963.....	54	158	2,254	2.39	7.00
1964.....	70	184	2,809	2.78	7.33
1965.....	80	264	3,200	2.50	8.25
1966.....	92	429	4,040	2.27	10.11
1967.....	93	521	³ 4,100	³ 2.26	³ 12.70
1968.....	³ 103	³ 554	³ 4,350	³ 2.36	³ 12.73

¹ New supply consists of shipments plus imports.
² Does not include tape and wire, nor components and parts belonging to SIC 3679.
³ Estimated.

Source: Bureau of the Census.

Table 3.—Principal Trading Partners
Radio and TV Receiving Sets—SIC 3651

United States buys from—	United States sells to—
Japan	Canada
Hong Kong	Mexico
Canada	Venezuela
United Kingdom	EEC
EEC	

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Radio and TV Receiving Sets—SIC 3651
[Dollars in millions]

Year	Total			1-19			20-99			100 and Over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	234	66,505	\$1,548	90	635	\$11	52	2,702	\$46	92	63,168	\$1,491
1963.....	348	81,264	2,255	170	1,044	20	82	3,914	78	96	76,306	2,157

Source: Bureau of the Census.

Table 5.—Key Ratios
Radio and TV Receiving Sets—SIC 3651

Item	1963
Investment per production worker.....	4,161
Specialization ratio (%).....	91
Concentration ratios (%):	
4 firms.....	41
8 firms.....	62
20 firms.....	82
50 firms.....	94

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Radio and TV Receiving Sets—SIC 3651

Geographic area	All employees	Geographic area	All employees
Total.....	81,264	East North Central.....	45,824
New England.....	2,173	Illinois.....	29,004
Connecticut.....	274	Michigan.....	977
Middle Atlantic.....	21,241	West.....	4,276
New York.....	13,196	California.....	4,239
		All other divisions.....	7,750
		Iowa.....	1,198

Source: Bureau of the Census.

Table 7.—Principal Products
Radio and TV Receiving Sets—SIC 3651

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Household and automobile radios, and radio-phonograph combinations	345	422	415	432	496	531	578	698	830	2.41
Household television receivers, including television combinations	727	815	775	812	925	1,092	1,292	1,687	2,357	3.24
Recorders, audio amplifiers, phonographs, tuners, speaker systems, and other audio equipment and accessories	409	503	445	462	524	431	460	590	682	1.67
Radio and TV receiving sets, N.S.K.	1	*4	*6	*5	*3	16	*16	*9	*6	N.C.

*Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.S.K. Not specified by kind.

Source: Bureau of the Census.

Railroad Cars

SIC 3742

Substantial growth has characterized the railroad car building industry during the period 1958-67. Capital expenditures increased nearly 250 percent from \$8.6 million in 1958 to \$35 million in 1966. Value of shipments increased over 200 percent during the last 10 years, from \$562 million to \$1.7 billion, while employment nearly doubled to a total of 44,000.

The main producing areas are located in the Northeast and North Central States.

Production of new railroad cars declined in 1968 to the level of 1966, reflecting some fall-off in orders during the suspension of the 7 percent investment tax credit, the increased cost of car maintenance, and the tapering off of railroad profits. Even with the restoration of the investment tax credit in June 1967, anticipated orders for new cars lagged as railroad profits decreased sharply. However, production is expected to rise as replacement orders increase.

GROWTH FACTORS

There are two growth factors in this industry: first, the depleted inventory of freight cars, which created excess demand for larger specialized freight cars, and second, the introduction of new technology to develop new railcars designed for rapid transit, commuter, and high-speed service, financed by the Urban Mass Transportation Act of 1964, as amended.

Railroads have made impressive advances in modernizing the freight car fleet in the past 5 years. The number of freight cars decreased by approximately 4 percent during this period, yet the aggregate carrying capacity increased about 4 percent with the building of larger specialized

railcars. Despite this advance, shortages of all types of cars still exist.

The principal reasons for this shortage appear to be (1) sharply increased demands for the shipment of lumber and grain; (2) abnormal "peaking" of shipping cycles; and (3) smaller numbers of general-purpose cars, the type used by the lumber and grain industries. The infusion of specialized high-capacity cars and the corresponding loss of general-purpose cars have been partially responsible for the improvement in car utilization, with resultant greater profits for railroads, lower rates for shippers, and better service.

The severe car shortages that occurred in 1966 emphasized anew the need for construction of additional all-purpose freight cars and improved utilization of the existing fleet.

The industry has stepped up its efforts to improve car distribution and utilization. The Association of American Railroads recently decided to establish a computerized system for effective freight car control. Other projects include development of car identification systems for use in a national information classification system.

The problem of adequacy of railroad transportation service has been studied by various governmental and private commissions. These commissions surveyed the number of railroad cars of various types, the ability of some types of cars to more adequately provide one kind of service and to serve as a satisfactory substitute for other cars, car location in relation to the points of demand, the efficiency of their use, changes in economic conditions, traffic volume and flow, and fluctuations in demand for service. One commission found, for example, that on occasion demand for cars of certain types, in certain areas, exceeds the capacity of the carriers. As the com-

mission pointed out, there is a limit on the total number of freight cars which can be placed in economical use. The cost of acquiring and maintaining these cars must be covered by the freight income which the cars can earn, and a reasonable prospect for efficient use on a year-round basis is a financial prerequisite. Optimally, the supply of cars should be such as to keep any interruption of freight flow within manageable proportions, while minimizing uneconomic investments in excess capacity.

FUTURE PROSPECTS

The depleted inventory of freight cars has caused an increase in demand for larger specialized

freight cars. Since 1959, retirements of railcars has consistently exceeded new railcar installation by a substantial margin. During the 5-year period 1959-64, the number of railcar retirements was 384,922, as opposed to 201,660 installations. This represents a net loss of 183,262 cars of all classes. In recent years, total freight car installations have improved in relation to retirements. Replacement demand for the more efficient types of cars is expected to brighten the prospects for the car building industry. Further impetus may come from the introduction of more innovative commuter and high-speed passenger cars, if experimental efforts now underway prove successful.

**Table 1.—General Statistics
Railroad Cars—SIC 3742**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	24,309	133,302	17,872	32,565	91,089	167,576	562,190	8,635	1.840	2.797
1959.....	23,418	139,246	17,926	33,623	96,909	246,037	513,397	9,339	2.539	2.882
1960.....	28,728	170,659	23,077	42,375	124,787	275,241	723,014	8,513	2.206	2.945
1961.....	22,625	144,812	16,698	31,157	96,680	184,217	538,920	8,542	1.905	3.103
1962.....	27,418	179,590	20,892	40,479	128,137	276,976	665,708	11,902	2.162	3.166
1963.....	30,742	201,999	24,254	47,246	150,135	355,230	927,184	10,877	2.366	3.178
1964.....	37,367	255,208	30,034	60,661	197,535	509,939	1,289,737	25,224	2.582	3.256
1965.....	40,858	286,422	33,245	65,647	221,541	528,890	1,519,751	25,725	2.387	3.375
1966.....	43,782	324,460	35,966	72,271	252,244	642,229	1,695,704	35,094	2.546	3.490
1967.....	¹ 45,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,747,000	N.A.	N.A.	N.A.
1968.....	¹ 44,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,721,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 4.—Number of Employees by Size of Establishment
Railroad Cars—SIC 3742**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	67	24,309	\$562	23	148	\$3	13	811	\$20	31	23,350	\$539
1963.....	78	30,742	927	20	172	5	22	1,090	37	36	29,480	885

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Railroad Cars—SIC 3742**

Geographic area	All employees
Total.....	30,742
North East and North Central.....	25,464
Pennsylvania.....	8,507
Ohio.....	2,953
South and West.....	5,278

Source: Bureau of the Census.

Tables 2 and 3 are not relevant to SIC 3742. Sufficient data were not available to prepare table 5.

Table 7.—Principal Products**Railroad Cars—SIC 3742**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Passenger train cars, new.....	11	12	39	18	17	36	63	78	6	0.55
Railroad and street cars, N.S.K.....	1	*3	*3	*3	*4	1	1	4	3	N.C.
Freight train cars, new street cars, and parts.....	516	499	710	498	627	833	1,172	1,394	1,649	3.20

*Standard error of estimate of 15 percent or more.

N.C.=Not computed.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Refrigeration Machinery

SIC 3585

Rapid growth of the refrigeration machinery industry is shown by the dramatic rise in industry shipments from \$1.44 billion in 1958 to \$3.25 billion in 1968. To support this 8.5 percent average annual growth rate, employment climbed 45 percent from 67,700 to 98,000. Air-conditioning equipment paced the industry's expansion by gaining in shipments from \$716 million to over \$2 billion during the past decade.

GROWTH FACTORS

Changing living patterns and rising affluence underlie the industry's success. Moving toward the 24-hour air-conditioned day, people have followed the trend of offices and stores and have added air-conditioning to their homes and automobiles. The *1960 Census of Housing* revealed that approximately 1 in 8 occupied housing units was air conditioned. Of 53 million units, 5.6 million, or 10.5 percent of the total, had one or more room air conditioners and 1 million units—only about 2 percent—had central units. Since 1960, home air conditioning has become a more prominent living feature. From 1963 to 1966, the percentage of new one-family homes sold with central units rose from 19 percent to 27 percent. This overall growth was particularly important in Southern States, where the gain was from 27 percent to 42 percent.

Statistics of FHA-insured one-family homes bear out this trend. In 1963, only 4.7 percent of all new and 6.1 percent of existing homes purchased with FHA-insured mortgages had central air conditioning. By 1967, these proportions had risen to over 24 percent and 9.5 percent.

Shipments of room air conditioners also have been important to the industry's growth. Of all

wired homes, over 35 percent had such units in 1968.

The U.S. consumer has shown an increasing preference for greater comfort while driving. Less than 5 percent of all new cars were equipped with factory air conditioning in 1958. By 1968, this had jumped to over 45 percent.

Price reductions have helped support the rise in sales of home and automobile units. For example, the BLS wholesale price index for room air conditioners fell from the 1957-59 base of 100 to a mid-1968 level of 80.8. The increased economies of mass production and technological developments, such as the introduction of the two-pole motor, have enabled the industry to lower prices.

Not all air conditioning is used purely for personal comfort. A significant amount of the industry's growth has depended on the increasing requirements of industrial and scientific processes for atmospheric control. Many electronic and other precision assemblies now require "clean rooms" for their manufacture.

Growth in the industry's shipments of commercial and industrial refrigeration equipment also reflects changes in the American way of life. Increasing varieties of frozen foods and refrigerated convenience foods and self-service marketing have created a growing demand for refrigerated enclosures, display cases, and cabinets. Similarly, increased use of frozen and prepared food by restaurants, institutions, and other food-serving establishments have stimulated shipments of commercial refrigeration equipment.

Two other rapidly selling industry products are commercial-type automatic icemakers and mechanical drinking-water coolers. The development of automatic icemakers for commercial

users has almost replaced the iceman and the iceplant, while shipments of mechanical drinking-water coolers have doubled since 1958 to an annual level of over \$40 million.

Exports of refrigeration machinery have paralleled domestic growth, rising from \$109 million in 1958 to \$330 million in 1968. Advanced technology, styling, and lower prices have made the U.S. industry the world leader. Consequently, foreign producers have found it difficult to compete in this market, and imports have amounted only to about 3 percent of exports.

FUTURE PROSPECTS

Air-conditioning equipment will continue to be the major vehicle of future industry growth. Relatively low saturation levels which exist in the principal markets—housing and automotive—and the industry's successful past performance in raising these levels indicate a promising future. New housing and new automobiles create the major submarket for the industry, but a production slowdown in these areas can be offset somewhat by increased sales for existing homes and cars.

Projections to 1975 of the number of U.S. households point to a 19- to 22-percent growth

from the 1965 level. Particularly significant for this industry, growth in the Southern and Western states is expected to exceed the national rate. For example, according to the *1960 Census of Housing*, 30 percent of all housing units in Texas were air-conditioned. From 1965-75, the number of Texas households is expected to increase about 25 percent. This growth in households, translated into new housing units for an area where home air conditioning is a prime factor, suggests a bright market potential.

As air conditioning of housing for middle- and upper-income families increases, the industry can look for the possible extension of this trend into lower income and public housing.

The record of industry sales to the automotive market also is encouraging. For new automobiles, the saturation level is near 50 percent, which leaves sufficient room for expansion in this market and in the secondary older car market.

Prospects also are good for increased sales of commercial refrigeration equipment. Anticipated growth in the number of shopping centers and food-serving establishments and the U.S. consumers' growing preferences for frozen and prepared convenience foods add to an expanding market.

**Table 1.—General Statistics
Refrigeration Machinery—SIC 3585**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	67,715	342,169	46,210	90,352	204,934	598,032	1,441,082	23,166	2.918	2.268
1959.....	69,350	377,760	47,898	95,522	224,181	733,391	1,641,520	26,110	3.271	2.347
1960.....	65,846	361,180	45,973	90,981	217,590	674,304	1,549,413	31,801	3.099	2.392
1961.....	62,795	349,836	44,182	86,583	212,601	608,116	1,501,918	37,880	2.860	2.455
1962.....	62,533	366,967	44,730	90,249	225,401	676,544	1,610,516	32,433	3.002	2.498
1963.....	72,330	432,583	50,676	101,231	268,304	892,686	1,928,001	33,471	3.327	2.650
1964.....	73,256	453,215	53,401	109,353	296,006	952,613	2,111,280	35,813	3.218	2.707
1965.....	79,802	499,078	59,525	119,542	330,481	1,055,100	2,314,304	53,999	3.193	2.765
1966.....	87,715	569,264	64,718	130,616	377,464	1,235,655	2,712,588	91,580	3.274	2.890
1967.....	¹ 92,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,000,000	N.A.	N.A.	N.A.
1968.....	¹ 98,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 3,250,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Refrigeration Machinery—SIC 3585

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$108.8	N.A.	\$1,430	7.6	N.A.
1959.....	111.0	N.A.	1,587	7.0	N.A.
1960.....	133.5	N.A.	1,606	8.3	N.A.
1961.....	135.9	N.A.	1,573	8.6	N.A.
1962.....	142.2	N.A.	1,776	8.0	N.A.
1963.....	157.6	N.A.	2,105	7.5	N.A.
1964.....	189.7	\$3.6	2,369	8.0	0.2
1965.....	209.4	6.4	2,731	7.7	.2
1966.....	251.3	7.6	3,130	8.0	.2
1967.....	286.8	N.A.	² 3,400	² 8.4	N.A.
1968.....	² 330.0	N.A.	² 3,675	² 9.0	N.A.

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Refrigeration Machinery—SIC 3585

United States buys from—

United States sells to—

(1)	Canada
(1)	Japan
(1)	Kuwait
(1)	West Germany
(1)	France
(1)	Mexico
(1)	Venezuela
(1)	Hong Kong

¹ Imports are relatively insignificant.

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Refrigeration Machinery—SIC 3585

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments
1958.....	625	67,715	(1)	347	2,403	(1)	164	7,569	(1)	114	57,743	(1)
1963.....	698	72,330	(1)	351	2,208	(1)	211	9,396	(1)	136	60,726	(1)

¹ Value shipments omitted, includes extensive duplication.

Source: Bureau of the Census.

Table 5.—Key Ratios
Refrigeration Machinery — SIC 3585

Item	1963
Investment per production worker.....	\$8,550
Specialization ratio (%).....	
Concentration ratios (%):	
4 firms.....	25
8 firms.....	39
20 firms.....	58
50 firms.....	77

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Refrigeration Machinery — SIC 3585

Geographic area	All em-employees	Geographic area	All em-employees
Total.....	72,330	South Atlantic.....	3,484
New England.....	1,652	North Carolina.....	922
Connecticut.....	755	Georgia.....	772
Middle Atlantic.....	20,495	Florida.....	325
New York.....	8,921	East South Central.....	3,123
New Jersey.....	3,050	Tennessee.....	537
Pennsylvania.....	8,524	West South Central.....	6,076
East North Central.....	24,797	Arkansas.....	369
Indiana.....	3,954	Oklahoma.....	806
Illinois.....	2,108	Texas.....	4,879
Michigan.....	6,873	Mountain.....	1,579
Wisconsin.....	4,401	Arizona.....	1,290
Ohio.....	7,461	Pacific.....	3,812
West North Central.....	7,312	Washington.....	292
Minnesota.....	2,717	California.....	3,349
Missouri.....	3,478		

Source: Bureau of the Census.

Table 7.—Principal products
Refrigeration Machinery—SIC 3585

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Heat transfer equipment.....	716	768	883	870	950	1,159	1,362	1,558	1,808	2.53
Commercial refrigeration equipment.....	240	269	261	250	287	254	276	325	357	1.48
Compressors and compressor units, all refrigerants.....	182	237	247	235	266	269	304	336	380	2.09
Condensing units, all refrigerants.....	70	105	109	98	103	74	75	73	88	1.25
Other refrigeration and air conditioning equipment.....	195	N.A.	N.A.	N.A.	N.A.	303	312	409	469	2.40
Refrigeration machinery, N.S.K.....	31	128	119	131	132	47	40	30	28	N.C.

¹ Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.C.=Not computed.

N.S.K.=Not specified by kind.

Source: Bureau of the Census.

Semiconductors

SIC 3674

Dynamic growth has characterized the semiconductor manufacturing industry over the past decade. A tripling of the 1958 value of shipments occurred in 1958, reaching \$1.0 billion in that year. A plateau in value of shipments of semiconductors has been established between 1966-68, and this is expected to continue in the near future. Employment between 1958 and 1968 increased 250 percent.

GROWTH FACTORS

The phenomenal post-war emergence and proliferation of electronic products for consumers, industry, science and the military would not have been possible without the explosive development of the U.S. semiconductor industry.

While some of the recent decline in growth can be attributed to a slowdown in television sales, part of the deceleration is believed due to the replacement of some discrete components by integrated circuits. Also partially responsible is a worsening foreign trade balance in semiconductors and related end products. The export market for U.S. components has become limited to higher performance devices, where the United States holds a technological advantage. International price competition in less sophisticated U.S. components has limited export expansion to very select markets. This has led to the establishment of overseas facilities by some American companies for the production of semiconductors supported by U.S. supplied parts and materials.

During 1966 and 1967 major U.S. producers made large capital investments in Hong Kong, Taiwan, Okinawa and Korea, as well as in European Economic Community, United Kingdom and Ireland. While some of the semiconductor exports from these overseas plants will enter world markets, the basic purpose of the Far East operations is supply for the U.S. market for consumer electronic products.

FUTURE PROSPECTS

Although a continuation of current value-of-shipment levels is anticipated for the semiconductor industry, the industry should continue in an evolutionary state for many years to come.

Technological refinement of semiconductor devices and new applications will result in an ever-changing product mix. Rising production costs will have to be countered by increased production efficiency and innovation to keep prices down.

Competition from Japan and the rest of the world is expected to increase over a widening range of semiconductors, despite U.S. overseas production and other efforts to penetrate foreign markets.

The increasing use of integrated circuits will limit the growth of discrete semiconductors in computers and other new applications, especially where miniaturization is desirable.

The interaction of all of these forces points to a growth which may not be as dynamic as that of the past, but which should follow a more conservative pattern of expansion.

Table 1.—General Statistics
Semiconductors (excluding integrated circuits)—SIC 3674

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	23,370	112,989	17,630	34,691	65,902	186,800	250,306	16,172	2.835	1,900
1959.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1960.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1961.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1962.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1963.....	56,349	320,875	37,548	77,113	168,504	467,035	687,817	52,439	2.772	2,185
1964.....	55,279	327,244	37,950	77,436	175,977	514,764	716,439	43,377	2.925	2,273
1965.....	67,395	401,403	48,667	98,912	227,964	680,054	911,669	61,322	2.983	2,305
1966.....	82,221	494,211	59,074	118,092	274,255	835,305	1,123,669	123,555	3.046	2,322
1967 ¹	¹ 82,131	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,012,700	N.A.	N.A.	N.A.
1968 ¹	¹ 81,901	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 962,120	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Semiconductors—SIC 3674

[Dollars in millions]

Year	Exports ²	Imports ²	Product ship-ments ²	Exports as a percent of shipments ²	Imports as a percent of new supply ^{1,2}
1958.....	\$15.3	N.A.	\$237	6.5	N.A.
1959.....	18.2	N.A.	390	4.7	N.A.
1960.....	28.9	N.A.	526	5.5	N.A.
1961.....	40.3	N.A.	553	7.2	N.A.
1962.....	49.7	N.A.	568	8.8	N.A.
1963.....	61.8	N.A.	623	9.9	N.A.
1964.....	78.3	\$8.4	638	12.3	1.9
1965.....	82.3	24.4	839	9.8	2.8
1966.....	130.4	42.3	1,068	12.2	3.8
1967.....	125.4	43.4	³ 960	³ 13.0	³ 4.3
1968.....	³ 120.0	³ 45.1	³ 890	³ 13.5	³ 4.8

¹ New supply consists of shipments plus imports.

² Excludes integrated circuits.

³ Estimate.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Semiconductors—SIC 3674

United States buys from—	United States sells to—
Japan Taiwan Hong Kong Netherlands	Japan France Switzerland Canada United Kingdom

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Semiconductors—SIC 3674

[Dollars in millions]

Year	Total			1-19			20-99			100 and Over		
	Establish-ments	Employ-ees	Ship-ments	Establish-ments	Employ-ees	Ship-ments	Establish-ments	Employ-ees	Ship-ments	Establish-ments	Employ-ees	Ship-ments
1958.....	¹ N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1963.....	107	56,349	688	20	154	2	31	1,787	21	56	54,408	665

¹ Part of Industry 3679.
N.A.=Not available.

Source: Bureau of the Census.

Table 5.—Key Ratios
Semiconductors—SIC 3674

Item	1958	1963
Investment per production worker	N.A.	9,815
Specialization ratio (%)	N.A.	88
Concentration ratios:		
4 firms	N.A.	46
8 firms	N.A.	65
20 firms	N.A.	90
50 firms	N.A.	99

N.A.=Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Semiconductors—SIC 3674

Geographic area	All employees
Total	56,349
New England	10,126
Massachusetts	6,337
Middle Atlantic	19,333
New York	4,614
New Jersey	3,665
Pennsylvania	11,054
North Central, South and West	26,890
California	11,198

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3674.

Special Tools and Dies

SIC 3544

The growth of the special tools and dies industry followed closely the rapid expansion of the metal-working industry in the United States during the 1958-66 period, particularly the automotive sector. The number of independent or contract shops grew from 5,745 establishments in 1958 to 5,896 establishments in 1963, while overall employment rose from 83,300 workers in 1958 to 120,300 in 1966. These shops account for 70 percent of special tools and dies production in the United States. The value of shipments of the industry, although indicating cyclical demands during the 1958-68 period, increased by almost 109 percent; from \$1.06 billion in 1958 to over \$2.2 billion in 1968. The five major product groups turned out by the industry were tools, die sets, jigs and fixtures, and industrial molds. Captive shops account for the balance of national production.

The special tools and dies industry is located in all geographical areas of the United States, with major plant concentrations in Michigan, the heart of the automotive industry (principal user of special tools and dies), Indiana, Illinois, Ohio, and Wisconsin.

GROWTH FACTORS

Technological advances and improvements in the production equipment acquired by the metal-working industry during the 1958-68 period, such as the application of numerical controls and electrical discharging machining to machine tools,

required radical changes in toolmaking processes by the special tools and dies industry. Greatly increased investment in capital equipment in all sectors of the U.S. economy, stimulated by the 1962 investment tax credit and revision of depreciation allowances, generated volume demand for special tools and dies.

FUTURE PROSPECTS

The introduction of technical improvements in industrial production machinery has caused a shift in the production mix of the special tools and dies industry, increasing demand for quality tools and dies and adversely affecting the demand for jigs and fixtures. This trend has been in evidence since 1963, and is likely to continue.

Die requirements for 1970 models of the automotive industry are below those of previous model years, reflecting changing technology and intensified expansion of the captive shops that produce special tools and dies.

Since 1966, shipments of the independent producers of special tools and dies have leveled off, and decreased somewhat in 1968. The decrease is attributed to the inability of many smaller independent shops (81 percent of the independent establishments employ less than 20 workers each) to adopt new technologies because of prohibitive costs, and increased production by the expanded captive shops.

Table 1.—General Statistics
Special Dies and Tools—SIC 3544

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958	83,308	536,588	68,916	139,877	415,241	780,090	1,060,566	43,242	1.879	2.969
1959	89,445	597,853	74,241	158,205	465,009	932,025	1,235,014	N.A.	2.004	2.939
1960	93,246	638,151	76,819	163,268	491,783	966,547	1,314,972	N.A.	1.965	3.012
1961	90,386	605,328	74,253	156,312	460,027	901,537	1,201,883	N.A.	1.960	2.943
1962	101,176	706,560	84,163	184,908	552,953	1,106,596	1,488,331	N.A.	2.001	2.990
1963	90,860	682,739	76,002	169,313	543,033	1,029,338	1,388,794	53,343	1.896	3.207
1964	93,782	741,663	78,700	179,090	581,588	1,180,087	1,571,337	49,458	2.029	3.247
1965	108,459	881,000	90,260	209,282	684,319	1,341,718	1,839,190	80,518	1.961	3.270
1966	120,325	1,028,345	100,799	231,750	792,576	1,664,546	2,217,907	133,880	2.100	3.420
1967	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2,350,000	N.A.	N.A.	N.A.
1968	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2,220,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2 and 3 are not relevant to SIC 3544.

Table 4.—Number of Employees by Size of Establishment
Special Tools and Dies—SIC 3544

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments	Estab-lishments	Employees	Ship-ments
1958	5,745	83,308	\$1,061	4,751	28,549	\$347	893	32,186	\$409	101	22,573	\$304
1963	5,896	90,860	1,389	4,763	29,472	428	1,030	38,303	589	103	23,085	372

Source: Bureau of the Census.

Table 5.—Key Ratios
Special Dies and Tools—SIC 3544

Item	1963
Investment per production worker	\$8,764
Specialization ratio (%)	93
Concentration ratios (%):	
4 firms	6
8 firms	9
20 firms	14
50 firms	21

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Special Dies and Tools—SIC 3544

Geographic area	All employees	Geographic area	All employees
Total	90,860	West North Central —Continued	
New England	7,789	Missouri	1,594
Massachusetts	3,482	Kansas	159
Rhode Island	368	South Atlantic	1,704
Connecticut	3,703	Maryland	149
Middle Atlantic	15,353	North Carolina	242
New York	5,865	Georgia	416
New Jersey	4,763	Florida	663
Pennsylvania	4,725	East South Central	1,000
East North Central	54,863	Kentucky	301
Indiana	5,298	Tennessee	494
Illinois	7,735	West South Central	813
Michigan	25,685	Arkansas	149
Wisconsin	3,574	Texas	561
Ohio	12,571	Mountain	446
West North Central	3,139	Arizona	189
Minnesota	759	Pacific	5,753
Iowa	551	California	5,667

Source: Bureau of the Census.

Table 7.—Principal Products
Special Dies and Tools—SIC 3544

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Industrial molds	163	180	209	206	230	221	243	295	342	2.10
Special dies and tools, die sets, jigs and fixtures, including N.S.K.	1,157	1,362	1,542	1,303	1,620	1,388	1,638	1,843	2,178	1.88

Source: Bureau of the Census.
N.S.K.=Not specified by kind.

Steel Foundries

SIC 3323

The steel foundries industry has experienced moderate growth in the past decade. Value of shipments of this industry rose 74 percent, for an average annual gain of 5.7 percent from 1958 to 1968, with the bulk of the gain occurring since 1963.

On a physical volume basis the annual increase in shipments equals 4.1 percent, rising from 1.1 million net tons in 1958 to an estimated 1.7 million in 1968.

Reflecting increased productivity, total employment grew only 2.3 percent annually between 1958 and 1968.

GROWTH FACTORS

About 85 percent of steel castings production is for commercial sale, the remaining 15 percent being for further finishing or fabricating in captive foundries. Steel castings have major industrial uses and form the framework for heavy machinery and equipment such as locomotives, railroad cars, cranes, hoists, and earthmoving equipment. They are also used in numerous valves and gears. Cast steels are characterized by a diversity of chemical properties, good machinability, and a range of tensile strengths.

High-alloy castings find extensive use in the manufacture of chemical, papermill, and dairy equipment. The distribution of steel castings by type in 1967 was as follows:

Type of casting	Thousands net tons	Percent total shipments
Carbon steel railway specialties.....	497	26.8
Carbon steel railway and transit rolling stock.....	216	11.6
Other carbon and alloy steel castings.....	1,144	61.6
Total.....	1,857	100.0

Steel foundries are relatively small establishments. According to the 1963 Census of Manufacturers, 128 out of 268 establishments had less than 100 employees and probably find it difficult to finance or to use optimally much automation. Still the general trend for the industry is toward increased modernization.

Capital expenditures averaging about \$22 million from 1958 to 1961, increased 134 percent to \$53.6 million by 1966. Most technological advances are directed at cutting costs through increased automation and quality improvement. Expected advances in mold design, for example will result in a more highly finished casting requiring less processing before final shipment to customers.

FUTURE PROSPECTS

The steel castings industry is heavily dependent on demand of the railroad equipment manufacturing industry. This industry is the single most important consumer of castings and accounted for almost 40 percent of castings shipments in 1967. Future prospects look bright as a rising population and GNP lead to growth in rail transportation requirements.

One analysis, for example, projects a 1967-75 requirement for an additional 62,000 freight cars per year above replacement demand. A total of 558,000 cars over the 9-year period is equivalent to a 31-percent expansion of the 1967 freight car fleet.

The demand for steel castings will be influenced favorably by the expected growth in the demand for products incorporating castings such as engines and turbines, construction equipment, metalworking machinery, and special industry machinery.

Table 1.—General Statistics
Steel Foundries—SIC 3323

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	49,133	254,338	40,134	74,390	186,778	383,870	596,276	22,239	2.055	2.511
1959.....	54,029	300,950	51,544	89,000	231,383	489,244	739,173	25,258	2.114	2.600
1960.....	50,807	288,073	45,223	81,816	219,753	439,099	700,488	19,221	1.998	2.686
1961.....	46,810	269,854	41,652	74,414	204,411	410,809	629,645	22,859	2.010	2.747
1962.....	50,506	303,200	45,204	83,773	235,983	484,252	729,688	23,569	2.052	2.817
1963.....	56,810	361,378	47,628	95,106	280,433	586,914	871,048	27,832	2.093	2.949
1964.....	62,010	418,348	52,603	109,031	329,233	661,559	987,069	31,389	2.009	3.020
1965.....	65,579	456,090	55,540	116,502	362,212	742,539	1,116,730	39,376	2.050	3.172
1966.....	70,797	509,597	59,753	127,038	402,984	855,212	1,278,952	53,563	2.122	3.172
1967.....	¹ 68,740	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,113,098	N.A.	N.A.	N.A.
1968.....	¹ 61,860	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,038,000	N.A.	N.A.	N.A.

¹ Estimated
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2, 3, and 7 are not relevant to SIC 3323.

Table 4.—Number of Employees by Size of Establishment
Steel Foundries—SIC 3323
[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments	Establish- ments	Employees	Ship- ments
1958.....	256	49,133	\$596	40	302	\$3	73	3,658	\$42	143	45,173	\$556
1963.....	267	56,810	871	47	359	11	81	4,148	63	139	52,303	797

Source: Bureau of the Census.

Table 5.—Key Ratios
Steel Foundries—SIC 3323

Item	1958	1963
Investment per production worker.....	¹ \$6,577	\$10,280
Specialization ratio (%).....	86	85
Concentration ratios (%):		
4 firms.....	25	23
8 firms.....	37	36
20 firms.....	56	56
50 firms.....	77	79

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Steel Foundries—SIC 3323

Geographic area	All employees	Geographic area	All employees
Total.....	56,810	East North Central—Con.	
New England.....	1,096	Wisconsin.....	4,118
Connecticut.....	501	Ohio.....	8,597
Middle Atlantic.....	15,751	West North Central.....	3,823
Pennsylvania.....	11,817	East South Central.....	1,007
East North Central.....	26,241	All other divisions.....	8,892
Indiana.....	4,118	Louisiana.....	771
Illinois.....	7,026	Washington.....	612
Michigan.....	2,382	Oregon.....	1,184

Source: Bureau of the Census.

Surgical and Medical Instruments

SIC 3841-2

Both the Surgical and Medical Instruments and the Surgical Appliances and Supplies industries have shown rapid and almost continuous growth in employment and value of shipments during the last decade. Total employment in these industries grew from over 34,000 in 1958 to over 77,000 in 1968—an increase of about 123 percent. During the same period, value of shipments increased by 150 percent from \$592 million in 1958 to almost \$1,479 million in 1968.

These industries are currently concentrated in the Middle Atlantic States, where almost 35 percent of their employees are located; New York alone accounts for almost 15 percent of the total U.S. employees engaged in the production of surgical and medical instruments, appliances and supplies. In California, another center of production, employment more than doubled between 1958 and 1963, and accounted for almost 10 percent of the industries' workers, second only to New York.

Expenditures for new plant and equipment showed substantial increases during the 1958-66 period. In 1958, almost \$12 million were spent by these industries in new plant and equipment. By 1966, this had risen to \$38 million—a more than 200 percent increase.

GROWTH FACTORS

The growth of these industries has been and will continue to be dependent on the increasing demand and substantially increasing quality of medical care. The Surgical and Medical Instruments Industry (SIC 3841) has, and will probably continue to grow at a more rapid rate than the Surgical Appliances and Supplies Industry (SIC 3842) due

to more rapid progress in medical practice and technology. One of the major factors which has greatly influenced the growth in instruments is the rapidly increasing trend to disposable apparatus such as hypodermic syringes, hypodermic needles, blood donor kits, and operator trays. It is estimated that, at present, the value of annual production of disposable hypodermic syringes is over \$60 million. In 1955, these items were practically unknown. Similarly, shipments of disposable hypodermic needles in 1968, are estimated at over \$40 million, substantially higher than 10 years ago, when the value of all hypodermic needles, disposable and reusable, produced was less than a third of this figure.

U.S. population increased about 17 percent in the 1955-1965 decade, while at the same time, the number of doctors increased only slightly more, 22 percent. However, there was a very rapid rise and increase in contribution to health services of other health personnel, which contributed substantially to the growth of both of these industries. For example, clinical laboratory personnel increased during this period by 70 percent, and professional nurses in practice by 44 percent. This increase in assistance to physicians had a major impact on health services (increasing "physician directed" services by 81 percent) as well as on the utilization of surgical and medical instruments, supplies and appliances.

Also importantly contributing to the growth of these industries was the almost phenomenal increase in the number of persons with hospital expense insurance protection. Between 1950 and 1965, the number of persons with such insurance plans has more than doubled to well over 150 million, and included about 80 percent of the total

U.S. population. Since then, Government-sponsored programs such as Medicare and Medicaid have further increased such participation.

It is estimated that the number of beds in both hospitals and nursing homes, 10 years from now, will increase approximately 50 percent from the 2½ million now in use. The largest proportional increase is expected in nursing homes, especially for the elderly.

Other factors contributing to the rapid growth of this industry are accelerated depreciation allowances; the trend toward outfitting additional treatment room by many doctors; and a rise in the number of practicing physicians.

FUTURE PROSPECTS

Some of the other major factors influencing the continuing growth of both of these industries are population increase, rising levels of education and income, and improved surgical techniques and technology. Increased participation in private and Government medical insurance plans specifically designed to extend to persons of all income levels at least a minimum of medical, surgical and orthopedic care is an important factor. Increased emphasis on early detection and prevention of diseases will also have its impact on these industries.

Population increase and changes in age groups will continue to contribute to growth. According to recent estimates by the Bureau of the Census, the U.S. population in 1980 will be between 227 and 243 million. Almost half will be under 19 years of age or over 65. These two segments of our population will receive, in the next 10 years,

proportionally more medical services than ever before.

The demand for medical care, as well as equipment and supplies, is directly related to family income and to educational level. Both of these factors will continue to rise, and with them a relative increase in requirements for medical and surgical care. It is projected that within 20 years, almost two-thirds of U.S. families will have incomes above \$10,000 in 1966 dollars.

Another important factor in the future growth of both of these industries is the establishment of neighborhood health centers. In 1969, it is estimated that almost \$100 million will be spent in equipping them. It is anticipated that this will grow to almost half a billion dollars by the year 1980.

It appears certain that the industry can look forward to continued substantial growth in selected products, and normal growth in others. Due to rapidly increasing costs of personal service and professional care in hospitals, it is safe to anticipate greater use of prepackaged trays, kits, disposable products, and other labor-saving devices.

Estimates have been made that hospital construction and replacement of obsolete equipment in hospitals alone will result in annual expenditures of billions of dollars. This, added to the estimated 8 percent annual increase in use of outpatient clinics, 10 percent annual increase in medical research, and an anticipated accelerated increase in hospital beds and nursing homes, will result in continuing rapid growth in the requirement for surgical and medical instruments as well as related apparatus and supplies.

**Table 1.—General Statistics
Surgical and Medical Instruments—SIC 3841**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	10,293	44,878	8,061	16,162	31,039	85,153	130,477	2,812	2.743	1.920
1959.....	10,240	50,402	7,685	15,447	31,550	84,309	141,961	2,538	2.672	2.042
1960.....	11,630	58,134	8,810	17,604	36,824	96,778	159,588	4,397	2.628	2.092
1961.....	11,741	61,637	8,893	17,576	38,791	106,966	181,514	4,780	2.757	2.207
1962.....	12,373	66,998	9,217	18,214	40,787	129,182	216,740	6,753	3.167	2.239
1963.....	15,145	83,332	11,538	22,916	52,520	168,556	284,014	10,514	3.209	2.292
1964.....	14,681	82,996	11,081	21,939	50,754	165,687	296,611	6,231	3.265	2.313
1965.....	15,385	89,412	11,339	22,467	52,591	188,288	297,834	10,864	3.580	2.341
1966.....	17,584	108,276	13,374	26,796	64,421	228,232	360,068	13,381	3.543	2.404
1967.....	¹ 20,700	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 430,000	N.A.	N.A.	N.A.
1968.....	¹ 23,810	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 515,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Surgical and Medical Instruments—SIC 3841

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	² \$29.1	N. A.	\$131	² 22.2	N. A.
1959.....	² 30.1	\$2.0	150	² 20.1	1.3
1960.....	² 28.8	2.4	160	² 18.0	1.5
1961.....	² 33.8	3.0	179	² 18.9	1.6
1962.....	² 38.7	3.8	201	² 19.3	1.9
1963.....	² 44.3	3.9	291	² 15.2	1.3
1964.....	² 51.4	4.6	316	² 16.3	1.4
1965.....	44.5	5.5	339	13.1	1.6
1966.....	49.5	6.3	360	13.8	1.7
1967.....	54.5	7.2	³ 414	³ 13.2	³ 1.7
1968.....	³ 59.5	³ 8.1	³ 476	³ 12.5	³ 1.7

¹ New supply consists of shipments plus imports.

² Export data includes respiratory appliances and electromedical diagnostic apparatus.

³ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Surgical and Medical Instruments—SIC 3841

United States buys from—

United States sells to—

United Kingdom
West Germany
Japan
France
Pakistan

Canada
United Kingdom
Mexico
Japan
Netherlands
France
West Germany

Source: Bureau of Census.

Table 4.—Number of Employees by Size of Establishment
Surgical and Medical Instruments—SIC 3841

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments
1958.....	231	10,293	\$130	143	731	\$10	63	2,567	\$30	25	6,995	\$90
1963.....	294	15,145	284	177	959	18	82	3,734	57	35	10,452	210

Source: Bureau of the Census.

Table 5.—Key Ratios
Surgical and Medical Instruments—SIC 3841

Item	1958	1963
Investment per production worker.....	N.A.	5,332
Specialization ratio (%).....	N.A.	88
Concentration ratios (%)		
4 firms.....	N.A.	47
8 firms.....	N.A.	58
20 firms.....	N.A.	72
50 firms.....	N.A.	86

N.A.=Not available.

Source: Bureau of Census.

Table 6.—Geographic Distribution, 1963
Surgical and Medical Instruments—SIC 3841

Geographic area	All em-employees	Geographic area	All em-employees
Total.....	15,145	West North Central.....	1,742
New England.....	1,965	South Atlantic.....	656
Massachusetts.....	645	East South Central.....	370
Middle Atlantic.....	5,284	West South Central.....	37
New York.....	2,474	Mountain.....	37
East North Central.....	2,908	Pacific.....	2,146
Indiana.....	473	California.....	2,139
Illinois.....	1,246		
Ohio.....	622		

Source: Bureau of Census.

Table 1.—General Statistics
Surgical Appliances and Supplies—SIC 3842

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	24,179	114,867	16,277	31,460	62,122	257,640	461,846	9,110	4.147	1.975
1959.....	26,458	148,478	17,561	35,638	71,104	331,665	547,620	N.A.	4.665	1.995
1960.....	27,311	158,396	17,312	34,736	72,860	365,023	571,583	12,069	5.010	2.098
1961.....	27,868	164,968	17,118	34,913	73,677	357,119	556,545	N.A.	4.847	2.110
1962.....	28,882	175,897	17,593	35,088	78,422	365,902	583,653	20,355	4.666	2.235
1963.....	28,267	161,800	18,987	37,904	85,790	370,273	596,666	17,831	4.316	2.263
1964.....	28,361	168,384	19,017	38,266	88,841	379,620	622,576	18,376	4.273	2.322
1965.....	31,561	193,322	21,336	42,345	101,596	418,278	680,420	17,274	4.117	2.399
1966.....	34,662	216,273	23,715	47,438	116,897	467,425	768,930	24,661	3.999	2.464
1967.....	¹ 38,750	¹ 250,000	N.A.	N.A.	N.A.	N.A.	¹ 861,200	N.A.	N.A.	N.A.
1968.....	¹ 43,400	¹ 283,000	N.A.	N.A.	N.A.	N.A.	¹ 964,550	N.A.	N.A.	N.A.

¹ Estimated.
N.A. = Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Surgical Appliances and Supplies—SIC 3842

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$23.9	N.A.	\$362	6.6	N.A.
1959.....	24.9	N.A.	443	5.6	N.A.
1960.....	25.5	N.A.	464	5.5	N.A.
1961.....	26.6	N.A.	445	6.0	N.A.
1962.....	32.2	N.A.	478	6.7	N.A.
1963.....	32.5	N.A.	462	7.0	N.A.
1964.....	33.1	\$3.8	491	6.7	.8
1965.....	35.0	3.7	537	6.5	.7
1966.....	53.8	3.8	769	7.0	.5
1967.....	60.3	3.9	² 861	² 7.0	² 5
1968.....	² 67.5	² 4.0	² 965	² 7.0	² 4

¹ New supply consists of shipments plus imports.

² Estimated.
N.A. = Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Surgical Appliances and Supplies—SIC 3842

United States buys from—

United States sells to—

Italy Japan	Canada United Kingdom Mexico
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Source: Bureau of Census.

Table 4.—Number of Employees by Size of Establishment
Surgical Appliances and Supplies—SIC 3842

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments	Establish-ments	Em-employees	Ship-ments
1958.....	590	24,179	\$462	429	2,234	\$29	114	5,198	\$73	47	16,747	\$360
1963.....	704	28,267	597	542	2,854	42	108	4,794	77	54	20,619	478

Source: Bureau of the Census.

Table 5.—Key Ratios
Surgical Appliances and Supplies—SIC 3842

Item	1958	1963
Investment per production worker.....	N.A.	\$8, 597
Specialization ratio (%).....	N.A.	80
Concentration ratios (%):		
4 firms.....	N.A.	49
8 firms.....	N.A.	58
20 firms.....	N.A.	71
50 firms.....	N.A.	84

N.A.=Not available.

Source: Bureau of Census.

Table 6.—Geographic Distribution, 1963
Surgical Appliances and Supplies—SIC 3842

Geographic area	All employees	Geographic area	All employees
Total.....	28, 267	Ohio.....	1, 148
New England.....	3, 986	West North Central.....	1, 353
Connecticut.....	1, 967	Minnesota.....	600
Middle Atlantic.....	11, 036	Missouri.....	620
New York.....	2, 930	South.....	3, 436
East North Central.....	6, 385	Louisiana.....	212
Illinois.....	3, 910	Mountain.....	253
Michigan.....	819	Pacific.....	1, 818
Wisconsin.....	483	California.....	1, 769

Source: Bureau of Census.

Table 7.—Principal Products
Surgical Appliances and Supplies—SIC 3842

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Surgical, orthopedic, and prosthetic appliances and supplies.....	257	317	340	312	320	318	337	370	415	1. 62
Personal industrial safety devices.....	56	70	65	74	98	97	107	127	139	2. 47
Electrical hearing aids.....	40	47	49	50	48	35	37	36	37	. 93
Surgical appliances and supplies, N.S.K.....	10	*10	*10	*10	*11	11	11	*4	*7	N.C.

*Standard error of estimate of 15 percent or more.

N.C.=Not computed.

Source: Bureau of the Census.

Synthetic Rubber

SIC 2822

Shipments of the synthetic rubber industry have increased about 90 percent during the last 10 years to about \$1 billion, while employment in this very capital-intensive industry has increased 45 percent. It provides jobs for only a little over 13,000 employees, of whom fewer than 9,000 are production workers. Most of the production occurs near sources of raw materials, e.g. petroleum refineries, and production units are often part of a petroleum complex.

Synthetic rubber is of two types, general-purpose elastomers and specialty elastomers. General-purpose elastomers compete with natural rubber, but because of favorable prices, uniform quality, technical assistance, and consumer ownership, synthetic rubber has obtained virtually all the growth in the market for general-purpose elastomers. Specialty elastomers are rubberlike materials with unique properties, such as resistance to oil, gasoline, and chemicals, or with special physical characteristics, such as maintaining elasticity at very high or very low temperatures.

Approximately two-thirds of all rubber is consumed in the manufacture of products used in transportation. These include tires and tire products for automobiles, trucks, buses, aircraft, agricultural equipment, and industrial equipment. Rubber is also consumed in several other components of vehicles, including belts, hose, battery boxes, gaskets, weather stripping, engine mounts, wire covering, and seat cushions.

GROWTH FACTORS

Rubber consumption for tires depends not only on the number of vehicles in operation but also on the vehicle weight, speed of operation, and operating conditions. The 50-percent increase in regis-

tered motor vehicles during the last 10 years has resulted in an 80-percent increase in annual tire shipments. About 80 percent of the total rubber consumed for tires and tire products is synthetic rubber.

The remaining one-third of rubber consumption finds its way into literally thousands of industrial and consumer products, such as: waterproof and leisure footwear; conveyor and transmission belting; hose and tubing; sponge and foam rubber goods; mechanical rubber goods; shoe products; druggist and medical sundries; and other rubber goods, such as clothing, thread, cement, toys and stationers sundries. From the standpoint of rubber consumption, mechanical rubber goods including hose and belting are by far the most important. The major markets for mechanical rubber goods are capital equipment and consumer durables; therefore, the growth in demand for consumer durables coupled with the demand for new capital equipment and the maintenance of current equipment determine the growth rate for this segment of synthetic rubber usage.

The military establishment is an important consumer of rubber products and items containing rubber. Of particular importance are aircraft tires, with over 60 percent of 1967 shipments for military use. During the same period, about 7 percent of truck and bus tire shipments were for military use. The number of truck and bus tires supplied to the military more than doubled between 1963 and 1967. Significant amounts of rubber also find their way into uniquely military equipment, such as tanks, and into products used by both the military and civilians, such as hose, belting, and wire insulation. A change in military expenditures, either upward or downward, will have a corresponding effect on the output of synthetic rubber.

FUTURE PROSPECTS

During the past 10 years, world consumption of synthetic rubber has grown at a rapid rate and may double by 1980. However, consumption has been outpaced by the growing world production and capacity to manufacture synthetic rubber. Non-Communist countries now have about 140 production facilities representing an investment of over \$2 billion. There are also over 30 synthetic rubber plants in Communist countries.

U.S. exports of synthetic rubber reached a peak in 1960, when they represented 25 percent of total U.S. production. After 1960, U.S. exports declined and then leveled off; currently, exports represent about 14 percent of total U.S. production. Although the export market for synthetic rubber

may not grow, it is a significant market and should remain important, particularly in view of the fact that U.S. rubber companies have a favorable market in the large number of their foreign manufacturing subsidiaries.

The future growth in the synthetic rubber industry is tied largely to developments in the transportation equipment industries, particularly passenger cars, trucks and buses. Consequently, the approach to the problems of inter- and intra-city transportation will have a profound effect on the future growth of synthetic rubber. If emphasis is placed on the construction of freeways and parking lots, more synthetic rubber will be required than if emphasis is placed on rail, water, or air transportation.

**Table 1.—General Statistics
Synthetic Rubber—SIC 2822**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	9,252	60,909	6,223	12,533	37,648	197,866	536,348	16,046	5.256	3.004
1959.....	9,898	67,759	6,897	14,052	43,890	281,518	703,281	17,275	6.414	3.123
1960.....	11,026	77,349	7,576	15,283	48,288	275,570	725,773	48,213	5.707	3.160
1961.....	10,929	79,830	7,452	14,542	49,107	291,800	696,407	59,535	5.942	3.377
1962.....	11,592	88,161	7,741	15,744	53,565	318,415	759,036	41,931	5.944	3.402
1963.....	11,840	93,507	7,844	15,915	56,615	329,520	763,891	32,328	5.820	3.557
1964.....	11,886	96,264	7,904	16,250	59,565	359,926	819,265	23,263	6.043	3.666
1965.....	11,880	99,974	7,819	15,900	59,318	391,887	847,674	35,136	6.607	3.731
1966.....	13,217	111,691	8,561	17,247	66,625	443,440	954,717	41,937	6.656	3.863
1967.....	¹ 13,100	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 920,000	N.A.	N.A.	N.A.
1968.....	¹ 13,700	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,025,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Synthetic Rubber—SIC 2822**

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$117.3	\$5.0	\$604	19.4	0.8
1959.....	170.0	4.0	763	22.3	.5
1960.....	200.7	5.3	789	25.4	.7
1961.....	172.1	6.4	760	22.6	.8
1962.....	169.5	6.7	823	20.6	.8
1963.....	155.5	9.2	862	18.0	1.1
1964.....	179.2	15.5	920	19.5	1.7
1965.....	161.2	19.9	950	17.0	2.1
1966.....	175.1	23.6	1,038	16.8	2.2
1967.....	170.4	20.8	² 1,025	² 16.7	² 2.0
1968.....	² 175.0	² 25.0	² 1,136	² 15.4	² 2.2

¹ New supply consists of shipments plus imports.

² Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Synthetic Rubber—SIC 2822**

United States buys from—	United States sells to—
Canada	Canada
Japan	United Kingdom
	Netherlands
	Belgium
	France
	West Germany
	Italy
	Japan

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Synthetic Rubber—SIC 2822**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	18	9,252	\$536	1	(1)	(1)	1	(1)	(1)	16	9,252	\$536
1963.....	24	11,840	\$764				3	(1)	(1)	21	11,840	764

¹ Data for these are included in 100 and over employees.

Source: Bureau of the Census.

**Table 5.—Key Ratios
Synthetic Rubber—SIC 2822**

Item	1958	1963
Investment per production worker.....	¹ \$39,980	\$53,314
Specialization ratio (%).....	95	92
Concentration ratios (%):		
4 firms.....	60	57
8 firms.....	86	80
20 firms.....	100	100
50 firms.....	N.A.	N.A.

¹ 1957

N.A.=Not applicable.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Synthetic Rubber—SIC 2822**

Geographic area	All em- ployees
Total.....	11,840
Northeast and North Central.....	2,313
South and West.....	9,527
Texas.....	3,461

Source: Bureau of the Census.

Table 7 not relevant to SIC 2822.

Telephone, Telegraph Apparatus

SIC 3661

The telephone and telegraph equipment manufacturing industry is a capital goods growth industry. In the past 10 years, value of shipments and value added by manufacturer have more than doubled. The annual growth rate in the value of shipments has exceeded 9.5 percent, and employment has risen from 80,000 to 127,000, for an increase of 59 percent.

GROWTH FACTORS

The basic communication service industry is one of increasing output, technological advance, and lower costs. These are healthy growth conditions for the equipment manufacturing industry. Growth in output of telephone and telegraph equipment is achieved through expansion and modernization of the telephone and telegraph service industry. Increases in these services and modernization and repair of equipment sustain a high level of demand for telephone and telegraph apparatus.

Telephone service, as measured by calls per day, increased by 53.5 percent between 1958 and 1966. The number of households with telephones increased from 72.5 percent to 80.6 percent at the same time. By contrast, the number of pieces of mail handled by the U.S. Post Office Department increased by 25.7 percent from 1958 to 1966.

While the cost of first-class mail rose from 3 to 6 cents per ounce, the cost of telephoning station-to-station from New York to San Francisco has decreased from \$2.50 to \$2 for a 3-minute call and a night rate of \$1.

The basic reason for growth in both service and equipment production is the increasing complexity and tempo of social and commercial life. Illustrative of these social and commercial trends are:

Higher standards of living and income; the increasing share of economic life which is carried on by market transactions; the rising mobility of individuals and families; the population shift to the cities where people, even though physically closer, are less likely to meet face-to-face.

Increased demand for communication service has a self-generating feature. Each time a new telephone is added to the system, a wider circle of contact is made possible not only for the new party but for the older subscribers as well.

In addition to private-line telephone service, the telephone network is used for teletypewriter exchange service, data and facsimile transmission, and transmission of television programs. Television transmission requires as much capacity as 1,000 separate telephone conversations. The interface connection of various computer services through the telephone network is becoming a major growth factor.

As a result of rapid growth in telephone communication, there has been an absolute decline in telegraph communications. Total messages transmitted declined from 132 million in 1958 to 94 million in 1965. Telegraph is now used mainly when a record of the communication is needed, or to transmit funds and to send gifts and greetings.

Technological developments greatly improve the quality of telephone communications service. Developments in transmission through facilities such as coaxial cable, microwave, and electronic central office switching make possible faster service at cheaper rates and, simultaneously, improve the quality of voice transmission.

Equipment manufacturing companies are research minded and in most cases share their research and development laboratories. The industry has made fundamental contributions in new product

development and has adapted new technologies of other industries. Among the new products developed by the industry are: Transistors, electronic switching, and solar batteries.

FUTURE PROSPECTS

The combination of forces that bolstered growth in the telephone and telegraph equipment industry in the past will provide the stimuli for future growth.

Technological developments, the increasing tempo of life, growth in economic activity, widening of human relationships, growth of population, the removal of space and time limitations on personal contacts, and more frequent contact with

other countries will all help to generate growth in telecommunications.

The technological future portends even greater growth than the immediate past. New developments are here or on the horizon that may make the past seem quite ordinary.

Increases in telecommunication capacity, which have been brought about by the application of coaxial cable and microwave and millimeter wave equipment, may be augmented further by laser beams. Automatic mechanical switching which has been outdated by electronic switching, replaced the manual switchboard and increased telecommunication capacity. Satellites which are already being used international communications may be applied to domestic telephone and telegraph communications networks.

**Table 1.—General Statistics
Telephone, Telegraph Apparatus—SIC 3661**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	80,061	430,739	54,340	105,522	268,869	715,511	1,207,955	102,810	2.661	2.548
1959.....	80,383	464,099	56,106	111,772	286,906	797,960	1,295,182	N.A.	2.781	2.567
1960.....	87,488	529,737	61,092	123,994	329,534	845,918	1,484,464	78,231	2.567	2.658
1961.....	92,237	562,195	62,441	124,155	339,057	1,004,141	1,680,375	65,327	2.962	2.731
1962.....	98,674	620,722	68,196	136,018	377,974	1,024,651	1,883,602	77,372	2.711	2.779
1963.....	89,465	554,375	63,983	122,707	358,741	1,013,792	1,736,358	55,127	2.826	2.924
1964.....	93,991	630,040	67,573	132,273	409,814	1,128,598	1,954,252	53,500	2.754	3.098
1965.....	102,226	705,438	75,270	150,136	469,296	1,361,468	2,272,626	89,893	2.901	3.126
1966.....	112,655	780,364	82,092	158,389	507,277	1,431,775	2,466,996	109,688	2.822	3.203
1967.....	¹ 127,100	N.A.	84,200	N.A.	N.A.	N.A.	¹ 2,720,000	N.A.	N.A.	N.A.
1968.....	¹ 127,300	N.A.	84,400	N.A.	N.A.	N.A.	¹ 2,990,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Telephone, Telegraph Apparatus—SIC 3661**

(Dollars in millions)

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$43.9	\$4.0	\$1,079	4.1	0.4
1959.....	33.5	7.8	1,245	2.7	.6
1960.....	29.9	11.0	1,431	2.1	.8
1961.....	25.7	13.3	1,583	1.6	.8
1962.....	35.7	13.2	1,758	2.0	.7
1963.....	31.3	16.4	1,538	2.0	1.1
1964.....	38.8	17.3	1,696	2.3	1.0
1965.....	36.4	17.0	1,953	1.9	.9
1966.....	37.1	32.6	2,151	1.7	1.5
1967.....	45.7	30.6	² 2,271	² 2.0	² 1.3
1968.....	² 54.0	² 30.0	² 2,400	² 2.3	² 1.2

¹ New supply consists of shipments plus imports.

² Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Telephone, Telegraph Apparatus—SIC 3661**

United States buys from—	United States sells to—
Canada Sweden West Germany	Canada United Kingdom Australia

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Telephone, Telegraph Apparatus—SIC 3661**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Estab- lishments	Employees	Ship- ments	Estab- lishments	Employees	Ship- ments	Estab- lishments	Employees	Ship- ments	Estab- lishments	Employees	Ship- ments
1958.....	95	85,544	(1)	40	167	(1)	13	664	(1)	42	84,713	(1)
1963.....	90	89,465	(1)	34	192	(1)	15	551	(1)	41	88,722	(1)

¹ Value of shipments omitted, includes extensive duplication.

Source: Bureau of the Census.

**Table 5.—Key Ratios
Telephone, Telegraph Apparatus—SIC #3661**

Item	1958	1963
Investment per production worker.....	¹ \$7,250	\$13,362
Specialization ratio (%).....		
Concentration ratios (%):		
4 firms.....	92	92
8 firms.....	97	96
20 firms.....	99+	99
50 firms.....	100	100

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Telephone, Telegraph Apparatus—SIC 3661**

Geographic area	All employees	Geographic area	All employees
Total.....	89,465	North Central.....	50,681
New England.....	10,467	South.....	9,389
Middle Atlantic.....	16,046	Pacific.....	2,882

Source: Bureau of the Census.

**Table 7.—Principal Products
Telephone, Telegraph Apparatus—SIC 3661**

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Telephone switching and switchboard equipment.....	435	418	514	585	613	491	582	700	800	1.84
Other telephone and telegraph (wire) apparatus, equip- ment, and components.....	637	821	910	992	1,127	1,045	1,113	1,249	1,320	2.07
Telephone, telegraph apparatus, N.S.K.....	7	6	*7	*5	*17	2	2	*4	*4	N.C.

N.C.=Not computed.

*Standard error of estimate of 15 percent or more.

N.S.K.=Not specified by Kind

Source: Bureau of the Census.

Textile Machinery

SIC 3552

Spectacular growth generally marked the textile machinery industry during the 1958-66 period. Modernization of textile mills had been spurred by the 7 percent investment tax credit instituted in 1962.

Suspension of the tax credit in October 1966, the tight money situation, and increasing imports of both textiles and textile machinery caused a sharp drop in demand for new U.S.-built machinery in 1967. Restoration of the investment tax credit has not sufficiently stimulated demand to overcome the downtrend which has continued into 1968. Over the 10-year period, however, textile machinery industry shipments doubled in value.

GROWTH FACTORS

Technological innovation has been characteristic of the industry since the first American cotton mill was built and equipped in 1793. Air conditioning of textile mills started as early as 1906. As a result of the technological revolution in textile machinery, today we have high speed, computerized processes throughout modern textile manufacturing plants. Among these machines are the high-speed roving frame, electronically controlled hopper feeder, bale-to-sliver processing with multiple cards in a "railroad line," and equipment specifically designed to handle the new man-made fibers.

A high percentage of profits invested in research and development resulted in marked advances in all types of textile machinery. These in turn produced more goods of better quality with less floor space and greatly improved working conditions. Demand for textile machinery depends upon the requirements of the textile mills, whose

operations reflect conditions in the textile products markets.

Population increases, new technology, domestic and export market promotion efforts and the increasing affluence of larger segments of industrialized countries are the principal factors affecting machinery sales.

In the domestic market, the 10-year period saw many clothing and other product changes in fabrics, styles, and design. The growing teenage market, increased job opportunities for minority groups and the resultant ability to buy greatly increased the market for textile mill products. The mill found it necessary to modernize and add high-speed equipment. Imported machinery, until recent years, did not have the built-in stamina necessary for U.S. production requirements. U.S. machinery makers benefited from their advanced management know-how, technology and marketing programs, which included sponsorship of the biennial Southern Machinery Exhibit and the International Exhibition held every 4 years.

After World War II, U.S. machinery makers were active in reconstructing war-torn areas of Europe and Asia. Textile machinery manufacturers were in the forefront of this effort. The United States maintained a high level of exports, surpassing the \$100 million-a-year mark in 1960.

In 1967, however, our foreign sales dipped and imports continued to rise as European technology and sales methods began to approach our own. For the first time, 1968 may see a deficit in U.S. international trade in textile machinery. Sections of the industry adversely affected include spinning, weaving and related machinery. However, machinery for winding, finishing, knitting, sewing, and carpet manufacturing were holding their own or improving their 1967 international trade records.

The Vietnam conflict increased demand for special types of machinery, e.g., sandbag production items; but in recent months this had been easing. All textile machinery is custom built, requiring at least 4 to 6 months leadtime. Marketing and production planning is, therefore, on a long-term basis. With increased labor and operating costs, U.S.-machinery manufacturers raised prices of many items, opening opportunities for foreign suppliers who were able to take advantage of their lower costs. To offset this competition, mergers of textile machinery companies in the United States have added to technological re-

sources and inspired better long-range modernization planning.

FUTURE PROSPECTS

Rapidly growing populations throughout the world, including the expected relative growth in the 18 to 64 age group, to whom new styles and assortments of textile products are increasingly important; enlarged family incomes; intensification of industrial research and development; possibly friendlier relations with Eastern European nations and Communist China, all portend a bright future for the United States textile machinery industry.

**Table 1.—General Statistics
Textile Machinery—SIC 3552**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	34,313	154,548	25,611	51,206	101,897	214,199	376,340	8,508	2.102	1.990
1959.....	35,766	173,594	27,627	58,194	120,553	271,336	445,493	6,813	2.251	2.072
1960.....	39,321	188,265	28,639	61,559	131,601	325,236	538,480	N.A.	2.471	2.138
1961.....	37,685	192,819	26,550	58,730	129,806	317,773	530,350	N.A.	2.448	2.210
1962.....	38,678	201,660	27,573	60,730	137,676	346,974	574,860	N.A.	2.520	2.267
1963.....	36,004	196,379	26,870	56,145	129,064	314,190	542,684	13,870	2.434	2.299
1964.....	37,533	212,105	28,231	59,021	142,101	359,354	605,211	N.A.	2.529	2.408
1965.....	41,241	247,225	30,809	68,145	166,264	408,238	707,916	20,220	2.455	2.440
1966.....	42,685	268,362	31,899	70,898	181,620	455,516	820,258	25,195	2.508	2.562
1967.....	¹ 40,100	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 640,000	N.A.	N.A.	N.A.
1968.....	¹ 37,300	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 580,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Textile Machinery—SIC 3552**

(Dollars in millions)

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$65.2	\$12.7	\$322	20.2	3.8
1959.....	74.5	20.6	400	18.6	4.9
1960.....	113.8	28.1	494	23.0	5.4
1961.....	138.8	35.4	489	28.4	6.8
1962.....	132.0	40.4	532	24.8	7.1
1963.....	110.6	38.3	499	22.2	7.1
1964.....	140.3	56.4	559	25.1	9.2
1965.....	126.7	74.8	664	19.1	10.1
1966.....	156.8	124.5	761.1	20.6	14.2
1967.....	128.4	128.1	² 723.3	² 17.8	² 15.0
1968.....	² 121.0	² 164.0	² 579.0	² 20.9	² 22.1

¹ New supply consists of shipments plus imports.

² Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Textile Machinery—SIC 3552**

United States Buys From—	United States sells to—
West Germany	Brazil
Switzerland	Canada
United Kingdom	Mexico
Spain	India
Italy	Argentina
Japan	Philippines
	West Germany
	Chile
	Colombia
	Australia
	Italy
	Spain
	France
	United Kingdom
	Venezuela
	Japan
	Belgium

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment**Textile Machinery—SIC 3552**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Em- ployees	Shipments	Establishments	Em- ployees	Shipments	Establishments	Em- ployees	Shipments	Establishments	Em- ployees	Shipments
1958.....	553	34,313	\$376	341	2,301	\$27	158	6,879	\$77	54	25,133	\$272
1963.....	561	36,004	543	345	2,256	36	156	6,520	97	60	27,228	410

Source: Bureau of the Census.

Table 5.—Key Ratios
Textile Machinery—SIC 3552

Item	1958	1963
Investment per production worker.....	¹ \$6,928	\$9,493
Specialization ratio (%).....	87	93
Concentration ratios (%):		
4 firms.....	34	35
8 firms.....	49	52
20 firms.....	64	67
50 firms.....	79	80

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Textile Machinery—SIC 3552

Geographic area	All employees	Geographic area	All employees
Total.....	36,004	East North Central.....	1,020
New England.....	14,260	Ohio.....	102
Vermont.....	211	West North Central.....	42
Massachusetts.....	9,794	South.....	11,936
Rhode Island.....	2,250	North Carolina.....	5,278
Middle Atlantic.....	8,707	South Carolina.....	4,811
New York.....	1,134	Georgia.....	1,133
New Jersey.....	1,387	West.....	39
Pennsylvania.....	6,186		

Source: Bureau of the Census.

Table 7.—Principal Products
Textile Machinery—SIC 3552

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Textile machinery.....	144	201	270	265	283	253	318	379	451	3.14
Parts and attachments for textile machinery.....	169	184	206	205	218	232	232	271	313	1.86
Textile machinery, N.S.K.....	10	N.A.	N.A.	N.A.	N.A.	14	*9	*14	*12	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.C.=Not computed

Source: Bureau of the Census.

Toilet Preparations

SIC 2844

The value of annual shipments of toilet preparations nearly tripled between 1958 and 1968. The number of persons employed by the industry increased by about half in the same period. By far the largest part of the producers are concentrated in the Middle Atlantic States, principally New York and New Jersey. A number of producers are also located in California and the Midwest.

Toilet preparations consist of two distinct segments—toiletries and cosmetics. Toiletries include utilitarian items such as deodorants, shampoo, and toothpaste. Cosmetics are used to enhance or beautify the person and include such things as lipstick, nail enamel, eye makeup, and fragrances.

GROWTH FACTORS

To a large extent the increase in the demand for toilet preparations has been the result of the growth in population, the rise in per capita incomes, greater general acceptance of cosmetics, increased urbanization, more leisure time, the emphasis in this country on appearing youthful, rapidly changing fashions, and the rise in the number of women in the labor force. Average per capita expenditures for cosmetics exceeded \$17 (at retail) in 1967, compared with \$14 as recently as 1963.

Every year hundreds of new products are put on the market and very skillfully merchandised. Although many of these products are discontinued because of disappointing sales, a few of the new items account for a large part of the industry's yearly growth. Further, the industry has become especially skilled in the use of packaging for promotional as well as functional purposes. Often, the package itself accounts for a sizable share of the

cost of an item. The use of fancy packages helps considerably in the sale of toilet articles as gift items.

Expenditures for merchandising by the toilet preparations industry are higher than such expenditures by most other U.S. industries. In total, expenditures for merchandising toilet preparations average approximately 35 percent of the value of sales. In 1967, network television advertising by the industry amounted to about \$280 million and magazine advertising approached \$100 million. Manufacturers of cosmetics train the sales personnel and demonstrators who work at the cosmetics counters of many department stores and drug stores.

Sales of almost every major toilet preparation have increased substantially in the past few years. During the past 5 years, annual sales of hair coloring products have more than tripled. Sales of fragrances have been increasing at about 10 percent each year. The higher priced men's colognes and aftershave lotions, merchandised like cosmetics, are one of the fastest growing segments of the industry. Sales of hair sprays continue to increase but not so rapidly as several years ago.

Changing hair styles have been responsible for declining sales of home permanents but this has been at least partially offset by the significant growth in the market for hair straighteners. Other growth products include lipstick, eye makeup, nail enamel, and hand lotions and face creams. Also, the market for deodorants in aerosol cans has been rising substantially.

Exports of cosmetics have been rising at a rate slightly less than domestic sales. Exports in 1967 were equivalent to about 1.3 percent of the value of the industry's shipments in that year. A substantial share of the exports go to foreign sub-

subsidiaries of U.S. companies. Sales by these subsidiaries have been growing at a rapid rate and should continue to do so. With the exception of French perfumes, American-made cosmetics are preferred by many people throughout the world.

FUTURE PROSPECTS

The toilet preparations industry is likely to continue to grow at a rapid rate as personal income in the United States rises and as more people be-

come relatively affluent. The increase in the number of women between 15 and 34 years of age in the population, which will occur in the next 10 years, will further favor the rapid growth of the industry. Also, cosmetics and toiletries are being accepted more and more by American men. Nevertheless, the future of the industry depends very greatly on the innovations that will be forthcoming over the years. Further, advertising will no doubt continue to help mold public tastes so as to increase sales of the various toilet preparations.

**Table 1.—General Statistics
Toilet Preparations—SIC 2844**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	29,464	133,951	18,541	36,010	66,685	697,529	1,059,161	14,318	10.460	1.852
1959.....	31,042	146,868	19,792	37,972	72,013	838,202	1,229,462	44,949	11.640	1.896
1960.....	30,841	150,456	19,607	38,300	73,259	863,500	1,261,392	11,619	11.787	1.913
1961.....	31,571	163,626	20,245	40,057	79,582	929,842	1,363,490	11,433	11.684	1.987
1962.....	33,613	173,964	20,877	40,511	80,662	1,015,903	1,500,988	14,380	12.595	1.991
1963.....	34,338	183,219	21,554	42,448	92,477	1,232,883	1,792,662	20,186	13.332	2.179
1964.....	35,399	193,302	21,725	43,123	97,126	1,378,836	2,003,766	19,870	14.196	2.252
1965.....	37,761	215,705	23,888	46,543	105,177	1,505,966	2,201,155	35,412	14.318	2.260
1966.....	40,644	248,160	25,262	49,630	121,565	1,674,868	2,430,620	33,560	13.778	2.449
1967.....	¹ 42,700	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 2,611,606	N.A.	N.A.	N.A.
1968.....	¹ 44,800	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 2,863,582	N.A.	N.A.	N.A.

¹ Estimated.
N.A. = Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Toilet Preparations—SIC 2844**

[Dollars in millions]

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$20.8	\$6.5	\$1,128	1.8	0.6
1959.....	25.4	4.7	1,276	2.0	.4
1960.....	25.7	6.6	1,360	1.9	.5
1961.....	24.2	7.5	1,497	1.6	.5
1962.....	26.4	7.5	1,616	1.6	.5
1963.....	27.5	7.7	1,859	1.5	.4
1964.....	31.5	² 10.8	2,089	1.5	.5
1965.....	33.0	² 12.3	2,286	1.4	.5
1966.....	36.6	12.4	2,545	1.4	.5
1967.....	36.4	³ 12.7	³ 2,765	³ 1.3	³ .5
1968.....	³ 37.0	³ 13.0	³ 3,010	³ 1.2	³ .4

¹ New supply consists of shipments plus imports.

² Excludes shaving preparations.

³ Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Toilet Preparations—SIC 2844**

United States buys from	United States sells to—
France West Germany Spain Japan	Canada Panama Hong Kong Japan

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment**Toilet Preparations—SIC 2844**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments	Establishments	Em- ployees	Ship- ments
1958.....	748	29,464	\$1,059	567	2,451	\$48	116	5,174	\$137	65	21,839	\$874
1963.....	707	34,338	1,793	524	2,311	58	100	4,046	103	83	27,981	1,631

Source: Bureau of the Census.

Table 5.—Key Ratios
Toilet Preparations—SIC 2844

Item	1958	1963
Investment per production worker.....	¹ \$7,534	\$9,737
Specialization ratio (%).....	92	91
Concentration ratios (%):		
4 firms.....	29	38
8 firms.....	45	52
20 firms.....	70	75
50 firms.....	87	90

¹ 1957.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Toilet Preparations—SIC 2844

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	34,338	West North Central.....	2,370
New England.....	3,347	Missouri.....	498
Middle Atlantic.....	17,130	South Atlantic.....	1,024
New York.....	8,188	East South Central.....	470
New Jersey.....	8,626	Tennessee.....	446
Pennsylvania.....	316	West South Central.....	222
East North Central.....	6,527	West.....	3,248
Illinois.....	4,548	California.....	3,095
Ohio.....	1,384		

Source: Bureau of the Census.

Table 7.—Principal Products
Toilet Preparations—SIC 2844

[In millions of dollars]

Class of product	1958	1959	1960	1961	1962	1963	1964	1965	1966	Ratio 66/58
Shaving preparations.....	75	80	86	87	104	111	123	145	162	2.1
Perfumes, toilet water, and colognes.....	103	140	149	183	190	209	242	264	341	3.2
Hair preparations (inc. shampoos).....	316	325	365	398	441	593	660	706	761	2.4
Dentifrices, inc. mouth washes, gargles and rinses.....	198	206	209	217	219	228	248	259	299	1.5
Other cosmetics and toilet preparations.....	418	510	533	605	660	698	800	889	961	2.3
Toilet preparations, N.S.K.....	16	N.A.	N.A.	N.A.	N.A.	20	16	*22	*21	N.C.

*Standard error of estimate of 15 percent or more.

N.A.=Not available.

N.S.K.=Not specified by kind.

N.C.=Not computed.

Source: Bureau of the Census.

Toys and Games

SIC 3941

The toys and games industry has achieved an enviable growth record over the past decade. From a half-billion dollar level in 1958, the industry has almost tripled shipments to \$1.45 billion in 1968. Employment has risen over 55 percent to 66,000. Significantly, this performance was recorded during a period of sluggish growth in the child population.

GROWTH FACTORS

Children and toys go together, but the industry's growth rate has surpassed the rate of increase in the number of children. Population under 15 years of age rose from 53 million in 1958 to over 60 million in 1968, or about one percent each year. To outstrip this growth in the number of prime consumers, the industry relied on aggressive marketing and product innovation to increase spending per child and to attract secondary customers above the age of 15.

Developments in consumers' attitudes and rising incomes provided the support for rapidly rising toy sales. Greater acceptance of the educational values of toys and a keener appreciation of the importance of toys to child development aided sales of products for the young. But not all of the industry's products are destined for children. Adult games, hobby kits, and miniature racing cars have wide appeal for other age groups. Older customers turned to the industry for such products which fit into their increased leisure time activities. These developments in toy demand were translated into sales by the continued growth in disposable personal income since 1958.

Developments in toy marketing also boosted sales significantly. TV advertising became a major selling tool. Whether seen coast-to-coast or only on

local stations, commercials showing children enjoying the latest toy appealed to youthful viewers who, in turn, strongly influenced their parents' toy purchases. The marketing of "add-on" type toys also gained prominence in this period. Such toys consist of a modestly priced basic unit to which the consumer can add a wide variety of extra accessories. Most toys have a limited life cycle of several years, but the demand for "add-on" toys appears more long-lived.

Seasonality of sales has always been a major problem of the toy industry. At retail, over 50 percent of the dollar volume and roughly 45 percent of all toys are purchased in November and December. Although the industry has not solved this problem, a certain amount of the growth in shipments has come from a stretchout in retail purchasing patterns and additional sales of products, such as games, puzzles, and hobby kits, which are not as closely tied to the traditional gift-giving Christmas season.

Basic to the toy industry's growth has been the sustained ability to create imaginative products and to capitalize on new materials. Particularly noteworthy has been the utilization of the wide variety of plastics developed during this period in both toy products and packaging.

Foreign trade has followed the domestic pattern of industry growth. Imports increased almost fourfold from the 1958 level, while exports gained at a rate below that of domestic shipments. A major factor in import growth was the importation by domestic producers of components and finished toys.

FUTURE PROSPECTS

The industry's performance over the past 10 years, coupled with projected rising affluence and

population growth, indicates rapid future growth. The fact that the industry was able to increase substantially its shipments during the mid-60's when the birth rate slackened is important. Even though projections of the child population vary greatly, there is generally agreement on a pick-up in the birth rate during the 1970's. An increase in the number of young customers added to the anticipated rise in the number of older consumers provides a broadening base for industry expansion.

The industry's past pattern of inventive product development should continue into the future. New products incorporating the latest materials and manufacturing technology may be expected. The adaptation of developments in the fields of education, science and electronics are—and will continue

to be—important inputs to the creation of new toys. During the 1960's, battery-operated and space toys came to the fore. In the 1970's, scaled-down teaching machines and electronic toys may be significant sellers.

Increasing industry concentration will help provide the necessary financial and marketing strength for future growth. The expenses of TV advertising and national and international toy marketing have created demands on companies' resources which have fostered mergers and stock issues. Recent entries, by acquisition, of large diversified companies into the industry indicate a realization of both the industry's long-range resource needs and its growth potential.

**Table 1.—General Statistics
Games and Toys—SIC 3941**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	42,972	149,725	35,999	68,007	106,577	288,863	544,056	16,513	2.710	1.567
1959.....	45,358	159,171	37,049	69,753	110,848	308,411	595,306	N.A.	2.782	1.589
1960.....	45,697	164,022	37,569	72,385	113,204	342,536	635,322	14,675	3.026	1.564
1961.....	50,395	183,266	41,370	78,156	126,003	411,339	736,507	14,863	3.265	1.612
1962.....	47,956	185,629	39,279	77,689	129,260	406,076	715,015	18,082	3.142	1.664
1963.....	51,835	206,744	44,031	84,425	145,243	444,101	796,631	27,728	3.058	1.720
1964.....	55,078	235,100	46,250	89,557	160,008	509,459	937,368	28,480	3.184	1.787
1965.....	62,141	271,290	52,568	100,693	180,912	575,641	1,087,370	32,590	3.182	1.797
1966.....	62,285	278,903	52,389	101,536	185,250	621,588	1,157,167	28,381	3.355	1.824
1967.....	¹ 64,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,300,000	N.A.	N.A.	N.A.
1968.....	¹ 66,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,450,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.—Not available.

Source: Bureau of the Census and BDSA

Tables 2, 3, and 7 are not relevant to SIC 3941.

**Table 4.—Number of Employees by Size of Establishment
Games and Toys—SIC 3941**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	854	42,972	\$544	487	2,837	\$38	263	12,020	\$155	104	28,115	\$351
1963.....	797	51,835	797	446	2,392	50	230	10,171	159	121	39,272	587

Source: Bureau of the Census.

**Table 5.—Key Ratios
Games and Toys—SIC 3941**

Item	1958	1963
Investment per production worker	¹ \$2, 578	\$4, 921
Specialization ratio (%).....	95	92
Concentration ratios (%):		
4 firms.....	13	15
8 firms.....	22	25
20 firms.....	35	43
50 firms.....	53	63

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Games and Toys—SIC 3941**

Geographic Area	All em- ployees	Geographic area	All em- ployees
'Total.....	51, 835	West North Central.....	1, 651
New England.....	6, 429	Minnesota.....	1, 031
New Hampshire.....	784	Missouri.....	515
Massachusetts.....	2, 487	South Atlantic.....	1, 403
Connecticut.....	1, 421	East South Central.....	939
Middle Atlantic.....	25, 969	Tennessee.....	613
New York.....	12, 427	West South Central.....	1, 926
New Jersey.....	8, 030	West.....	3, 338
Pennsylvania.....	5, 512	Oregon.....	248
East North Central.....	10, 180	California.....	3, 037
Illinois.....	4, 090		

Source: Bureau of the Census.

Trailer Coaches

SIC 3791

Trailer coaches, including mobile homes, travel trailers and pickup campers, have enjoyed heady sales and widespread popularity. During the past decade, dollar shipments and total employment have more than doubled. Vacation vehicles, which averaged about one-third of total shipments, grew at a steadier and higher rate than mobile homes in that period.

GROWTH FACTORS

The industry's focus has changed entirely since its inception in the early 1930's. The first trailer coaches were built as vacation vehicles for those who desired more comfort than was afforded by tent trailers or conventional camping equipment. In the middle 1930's, during the Great Depression, families used trailer coaches to move to sections of the country where jobs were more plentiful. Migratory workers used, and still use, trailer coaches for travel and housing on job sites. Although most of the trailer coaches on the road during the 1930's were built in backyards, commercial production grew at such a rate as to make the industry one of the fastest growing in the country.

The industry took on a different complexion with the advent of World War II. The fast-paced buildup in military forces and industrial production caused vast shifts in population location. Areas surrounding military camps could not provide adequate housing facilities for military men or their families. Many of the plants built to produce war materiel were constructed in areas outside of cities, where population densities were low. Temporary housing was needed for construction workers and, later, permanent housing was needed for plant workers and their families. The trailer coach industry stepped in and filled the

shelter needs of a large number of these families. Many construction and plant workers and servicemen purchased trailer coaches for use as semi-permanent housing when they could not find other more desirable dwellings. The National Housing Agency also purchased a large number of trailer coaches to house production workers near defense plants.

Production of trailer coaches helped to alleviate the critical housing shortage that resulted from the return of servicemen and new family formation after World War II. Between 1946 and 1951, the number of manufacturers doubled, while the number of dealers quadrupled.

Focus changed once again in the middle 1950's when the industry began to develop two distinct product lines for separate expanding markets: travel trailers for vacation use; and mobile homes for permanent dwelling. Mobile homes became larger and contained more luxurious appointments.

According to the Recreational Vehicle Institute, travel trailer sales increased from 32,000 units in 1958 to 130,000 units in 1967, reflecting increases in both disposable personal income and leisure time during the period. Another factor that has influenced travel trailer growth has been the persistence of national advertising campaigns to "See America First" sponsored by the Federal Government, oil companies, airlines, and automobile manufacturers. This advertising has whetted American appetites to see their country, and the travel trailer has provided a relatively inexpensive means to do it.

Mobile homes have become an increasingly important part of the permanent housing market in the past decade. Sales grew from 102,000 units in 1958 to 240,000 units in 1967. The Mobile Homes Manufacturers' Association estimates that

couples under 34 years of age purchase 43 percent of all mobile homes and get two-bedroom homes plus furnishings for an average of \$5,700. The elderly and retired, who constitute about 25 percent of the market, are attracted by the low price, ease of maintenance, and the convenience of mobile homes.

One of the major problems the industry has faced during its development has been the fact that a large proportion of the facilities for parking mobile homes has not been adequate to meet the physical needs of mobile-home dwellers, nor have parks been attractive in location or appearance. Mobile home industry associations have worked to change local zoning ordinances to permit parks to be located on acreage away from major highways, railroad tracks and other areas that are undesirable from a residential point of view.

Private builders have become interested in developing mobile-home communities and including them as part of the overall development plan for the area. While some mobile-home parks cater to the interests of special groups, senior citizens for example, most are structured for family living.

FUTURE PROSPECTS

Several factors will promote continuing rapid growth in vacation vehicle sales. Unprecedented increases in personal income in the coming decade, coupled with a larger number of national holidays and 3-day weekends, will have a favorable impact

on recreation spending in general. Federal and State spending is supporting an interstate highway program that will facilitate and encourage travel within this country. The Land and Water Conservation Fund Act of 1964 will continue to promote recreational vehicle sales, as it provides funds for establishing new parks and improving old ones.

The need for low-cost housing will be the most important factor in mobile-home growth in the near future. Low-cost housing is critically needed to replace slum dwellings as well as to accommodate young marrieds and retired couples, two of the fastest growing segments of the population. The number of households headed by a young adult, aged 25 years or under, will increase by about 35 percent by 1975. A 15-percent increase in the number of households headed by a person aged 65 years or more is estimated for that year.

The mobile home industry already supplies about 75 percent of single-family homes selling for less than \$12,500 and nearly 25 percent of all nonfarm single family dwelling units. Manufacturers will continue to produce mobile homes in increasing numbers, while they shift a large proportion of their resources into making factory-built homes to be transported to the site. The experimental townhouses and apartments that are being constructed now, using modified mobile homes as modular units and sections, are the vanguard of low-cost housing in the future.

**Table 1.—General Statistics
Trailer Coaches—SIC 3791**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	18,717	77,129	16,004	30,613	58,969	127,683	461,053	7,726	2.165	1.926
1959.....	21,435	95,383	18,101	34,940	69,384	159,453	538,654	7,976	2.298	1.986
1960.....	22,318	93,966	18,616	34,257	68,173	159,325	523,765	N.A.	2.337	1.990
1961.....	20,703	88,705	17,457	29,814	64,807	135,111	464,133	N.A.	2.085	2.174
1962.....	21,047	97,698	17,949	31,323	73,889	153,181	507,583	N.A.	2.073	2.359
1963.....	25,669	125,002	21,901	43,390	94,078	232,460	713,119	9,584	2.471	2.168
1964.....	32,686	161,401	27,634	55,747	122,447	286,591	929,753	9,634	2.341	2.196
1965.....	35,754	179,499	30,035	58,125	132,787	332,065	1,032,729	12,573	2.501	2.285
1966.....	38,573	199,266	32,462	61,746	147,123	354,890	1,089,306	41,878	2.412	2.383
1967.....	¹ 41,700	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,190,000	N.A.	N.A.	N.A.
1968.....	¹ 45,600	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,406,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.=Not available.

Source: Bureau of the Census and BDSA.

Tables 2, 3 and 7 are not relevant.

Table 4.—Number of Employees by Size of Establishment**Trailer Coaches—SIC 3791**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	386	18,717	\$461	177	1,003	\$20	149	7,247	\$144	60	10,467	\$297
1963.....	413	25,669	713	161	896	19	164	8,329	216	88	16,444	478

Source: Bureau of the Census.

Table 5.—Key Ratios
Trailer Coaches—SIC 3791

Item	1963
Investment per production worker	\$2,996
Specialization ratio (%).....	98
Concentration ratios (%):	
4 firms.....	22
8 firms.....	37
20 firms.....	53
50 firms.....	71

N.A. = Not available.

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963**Trailer Coaches—SIC 3791**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	25,669	South Atlantic—Continued	
New England.....	30	Florida.....	924
Middle Atlantic.....	1,557	East South Central.....	796
East North Central.....	9,356	West South Central.....	1,737
Indiana.....	4,245	Arkansas.....	174
Michigan.....	3,593	Oklahoma.....	454
Ohio.....	661	Texas.....	1,109
West North Central.....	2,327	Mountain.....	976
Iowa.....	261	Idaho.....	405
Missouri.....	165	Colorado.....	179
Nebraska.....	555	Arizona.....	200
Kansas.....	1,108	Pacific.....	5,592
South Atlantic.....	3,298	Washington.....	155
North Carolina.....	371	Oregon.....	322
Georgia.....	1,492	California.....	5,115

Source: Bureau of the Census.

Truck and Bus Bodies

SIC 3713

The manufacture of truck and bus bodies showed remarkable gains during the 10-year period, 1958-68. Factory shipments more than doubled while employment increased 60 percent. Most of the manufacturing operations are concentrated in the Middle Atlantic and North Central States.

GROWTH FACTORS

Freight hauling increased in line with population growth and development of the Nation's highway network. Although the railroads, barge-lines, and airlines continue to be utilized for long hauls, the flexibility provided by trucks for operations at both ends makes trucking more and more important. Much of the freight is carried in truck bodies from the terminals of trailer truck lines.

A factor influencing demand for bus bodies was the increasing practice of bussing school students from their homes to the schools. The increase in travel by the large bus lines from city to city also created the need for the manufacture of more bus bodies.

Truck bodies, as distinct from trailers, are secured to the chassis frame and include the following types: pickup truck bodies; utility bodies utilized by plumbers, electricians, and others for hauling tools and equipment; van truck bodies used for general commodity distribution from truck line warehouses to destinations; tank bodies for hauling fuel; and the largest volume item, flat-bed or stake bodies, are utilized extensively by lumbermen and farmers.

Many independent manufacturers are involved in truck body manufacture. However, a large percentage of such bodies are the products of

captive companies, particularly those controlled by the large automotive product manufacturers. Van truck bodies are made by the same manufacturers who make trailers. They are shipped in crates for assembly by retailers. Such crates may be as small as 12' x 8' x 3' and can contain a 12' long body for assembly by the retailer. Manufacturers of hydraulic systems build dump truck bodies which are adjusted to the requirements of the pump and hydraulic hoist business.

New technology in the manufacture of bodies for trucks and buses includes the stressed skin construction, adopted from the aviation industry, which permits the use of aluminum for van truck bodies. This lightens the vehicle, permitting a greater payload. The use of aluminum led to a further innovation. Because of the large volume of aluminum they use, the trailer and truck body manufacturers were able to persuade the aluminum industry to produce rolls of 8' wide sheet. This permitted the use of one-piece seamless roofs, making them completely watertight.

Truck bodies are generally sold directly by the manufacturer to the retailer. In the case of bus bodies, the manufacturer is often a captive of the busline. The largest buslines in the United States manufacture their bus bodies abroad; one in Belgium and one in Germany.

Dump truck body manufacturing is so competitive that little or no profit is made on the product. The profit necessarily comes from the installation charge; i.e., the mounting of the body on the chassis, and installing hydraulic systems for dumping.

The Vietnam conflict has not been a significant factor in the demand for truck and bus bodies.

However, proposed legislation (S. 2658), which would permit bus and truck bodies to be 102" wide instead of 96" would, if passed, outdate many of the truck and bus bodies now on the highways, creating demand for the manufacture of wider bodies.

The international trade picture in truck bodies and chassis has been profoundly affected by the United States-Canadian Automotive Product Trade Agreement. Imports from Canada of these products have greatly increased since 1965. Exports from the United States have not kept pace with this large increase. Large imports for assembly by sightseeing-bus makers are the largest single factor in growing bus body imports.

FUTURE PROSPECTS

The tendency toward containerization of freight may have a significant effect upon the manufacture of truck bodies. It is not yet clear whether bodies fastened to truck chassis will shift extensively to the container type.

The overall increase in transportation capacity for truck bodies, regardless of type, should be about 5-10 percent per annum during the next few years. Air freight and waterborne freight, while increasing in some areas, should not greatly affect the manufacture of truck bodies.

It is expected that, under the United States-Canadian Automotive Product/Trade Agreement, the U.S. will continue to add to its imports of truck bodies and chassis from Canada.

**Table 1.—General Statistics
Truck and Bus Bodies—SIC 3713**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	20,009	91,374	15,938	30,741	65,405	145,608	307,769	3,627	2.226	2.128
1959.....	22,815	108,904	18,007	35,681	78,045	157,582	362,803	N.A.	2.019	2.187
1960.....	24,247	120,144	21,171	37,686	87,518	172,737	394,813	N.A.	1.973	2.322
1961.....	23,237	115,554	18,278	36,606	80,890	160,341	374,121	33,843	1.982	2.210
1962.....	25,066	131,713	19,707	41,182	94,448	200,302	503,970	N.A.	2.121	2.293
1963.....	24,466	133,300	19,729	40,897	98,359	229,472	476,733	6,554	2.333	2.405
1964.....	25,994	143,799	20,842	42,324	103,720	243,120	507,617	10,560	2.344	2.451
1965.....	28,032	164,807	22,535	47,283	120,728	273,240	569,788	10,140	2.263	2.553
1966.....	31,624	191,060	25,762	53,682	139,773	322,292	718,636	38,460	2.306	2.604
1967.....	¹ 32,200	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 780,000	N.A.	N.A.	N.A.
1968.....	¹ 32,800	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 860,000	N.A.	N.A.	N.A.

¹ Estimated.
N.A.= Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Truck and Bus Bodies—SIC 3713**

(Dollars in millions)

Year	Ex-ports	Im-ports	Product ship-ments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$3.4	² \$2.0	\$307.8	1.1	0.6
1959.....	4.3	² 1.0	362.8	1.2	.3
1960.....	3.0	² 1.0	394.8	.8	.2
1961.....	4.4	² 1.5	374.1	1.2	.4
1962.....	7.0	² 2.3	504.0	1.4	.4
1963.....	4.9	³ 1.2	476.7	1.0	(⁴)
1964.....	5.6	³ 3.4	507.6	1.1	.7
1965.....	10.0	³ 5.0	570.0	1.8	.9
1966.....	13.3	³ 56.8	718.6	1.8	7.3
1967.....	12.6	³ 64.0	N.A.	N.A.	N.A.
1968.....	⁵ 7.9	⁵ 123.3	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Includes bus chassis as well as bodies.

³ Includes truck and bus chassis as well as bodies.

⁴ Less than 0.1 percent.

⁵ Estimated.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Truck and Bus Bodies—SIC 3713**

United States buys from—	United States sells to—
West Germany	Canada
Canada	Venezuela
United Kingdom	Iran

Source: Bureau of the Census.

**Table 4.—Number of Employees by Size of Establishment
Truck and Bus Bodies—SIC 3713**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments	Establish-ments	Em-ployees	Ship-ments
1958.....	562	20,009	\$308	375	2,663	\$39	147	6,022	\$94	40	11,324	\$174
1963.....	610	24,466	477	402	3,093	54	163	6,816	133	45	14,557	290

Source: Bureau of the Census.

**Table 5.—Key Ratios
Truck and Bus Bodies—SIC 3713**

Item	1958	1963
Investment per production worker.....	¹ \$3,994	\$5,06 ³
Specialization ratio (%).....	87	88
Concentration ratios (%):		
4 firms.....	21	22
8 firms.....	31	32
20 firms.....	49	50
50 firms.....	68	66

¹ 1957.

Source: Bureau of the Census.

**Table 6.—Geographic Distribution, 1963
Truck and Bus Bodies—SIC 3713**

Geographic area	All em-ployees	Geographic area	All em-ployees
Total.....	24,466	South Atlantic.....	2,828
New England.....	424	Maryland.....	162
Middle Atlantic.....	3,362	Virginia.....	423
New York.....	1,075	Georgia.....	901
New Jersey.....	566	East South Central.....	1,192
Pennsylvania.....	1,721	Alabama.....	334
East North Central.....	10,864	West South Central.....	1,006
Illinois.....	980	Texas.....	475
Michigan.....	2,027	Mountain.....	170
West North Central.....	1,993	Pacific.....	2,627
Minnesota.....	331	Washington.....	182
Iowa.....	281	Oregon.....	280
Missouri.....	1,128	California.....	2,165
Nebraska.....	152		

Source: Bureau of the Census.

Table 7 is not relevant to SIC 3713.

Truck Trailers

SIC 3715

Following World War II the manufacture of truck trailers became a booming business. Factory shipments and employment doubled during the decade beginning with 1958. Manufacturing operations are widespread, but the Middle Atlantic and North Central States account for more than half.

GROWTH FACTORS

The U.S. population explosion which was accompanied by the highway network expansion and the resultant mobility of people contributed greatly to the growth of this industry. The hauling of freight of every description increased and keen competition for such business developed between the traditional handlers, the railroads, and the fast developing trucking services. The railroads maintained their supremacy in the field of long distance bulk commodity shipments, but the flexibility provided by truck trailer operations proved advantageous when rapid short hauls were required for packaged goods.

Design and material technology, some of which was developed by airplane manufacturers, permitted the building of stronger and lighter trailers. The imposition of gross weight ceilings by State laws meant that equipment weight had to be reduced if payloads were to increase. Thus modern vans are now made of aluminum instead of steel, and 40-foot trailers are replacing 26-foot steel, single-axle types.

A recent development in the industry is the "land bridge concept." Practically all containerized marine cargo has to move, at least a short distance, by truck. Railroad container-on-flatcar movement is uneconomical for distances of less than 200 miles. Thus the modern cargo container, for which 122 container ships were under construc-

tion in the last 6 months of 1967, can become a replacement for the van or tank trailer handled by highway tractor at both ends of the ocean voyage. The interchangeability of equipment on a worldwide basis will call for adjustments and modifications which will be far reaching, including the possibility of diminishing U.S. exports of truck trailers as now designed.

Other influences are at work to cause concern about our foreign truck trailer markets, which amounted to over \$17 million in 1966, the best year. In addition to the impact of high labor and material costs on selling prices, there is the longevity of trailers. Many on U.S. highways are over 10 years old and some have been in use over 30 years. As long as length and weight factors permit a profitmaking operation, truckers are reluctant to replace equipment.

Military and other Government requirements have increased in recent years. These, plus exports, were estimated at over 12,000 units in 1967, compared with 6,177 in 1966. This was about 10 percent of the total output of trailers, estimated at more than 111,000 for 1967.

Because of the relatively small capital investment and production know-how needed, trailer manufacturing has its share of starters who stay in business for only short periods. Two large firms, operating through more than 100 branches, annually obtain a large share of the market, ranging from 55 to 70 percent. Thus franchised dealerships are no longer relied upon to the extent that they were prior to World War II. In recent years large orders for containers sent directly to factories by railroads have diminished the importance to the manufacturer of the small trucker, because of the high cost of sales per unit to the latter. Another recent development which

will have a beneficial effect in the industry is the possible passage of Federal legislation (S. 2658) permitting trailers in interstate commerce to be 6 inches wider. It is estimated that, if passed, 70 percent of the vans in current use will become obsolete.

FUTURE PROSPECTS

The legislation referred to above plus the economics of containerization will effect large increases in total production. Adding 6 inches to

trailer width will increase payloads substantially, and every van trailer now in use will have to be considered for replacement. There were 1.5 million units in the national fleet in 1966. Normally about 100,000 are added annually. Replacement of outmoded models with conventional types should almost double for a few years before container application to freight movement becomes general. At that time conventional trailer production should begin to taper off and may be severely curtailed.

**Table 1.—General Statistics
Truck Trailers—SIC 3715**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	15,669	78,142	12,090	24,564	55,390	131,140	334,724	5,072	2.368	2.255
1959.....	20,622	107,127	16,701	35,413	77,990	203,195	505,418	N.A.	2.605	2.202
1960.....	18,854	101,564	14,729	29,583	72,725	170,094	438,548	7,899	2.339	2.458
1961.....	17,205	94,260	13,255	26,274	65,792	158,058	405,403	10,182	2.402	2.504
1962.....	20,205	117,329	15,833	31,789	83,029	218,489	543,804	6,150	2.631	2.612
1963.....	19,429	112,876	15,455	30,896	81,703	205,475	515,661	5,265	2.515	2.644
1964.....	21,788	129,363	17,341	34,377	94,686	231,384	588,412	13,789	2.444	2.754
1965.....	24,056	150,065	19,475	39,649	111,343	268,445	690,397	7,566	2.411	2.808
1966.....	28,082	175,222	22,859	44,915	129,257	314,409	795,592	25,472	2.432	2.878
1967.....	¹ 29,500	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 900,000	N.A.	N.A.	N.A.
1968.....	¹ 31,000	N.A.	N.A.	N.A.	N.A.	N.A.	¹ 1,000,000	N.A.	N.A.	N.A.

¹ Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 2.—Foreign Trade
Truck Trailers—SIC 3715**

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	\$20.6	N.A.	\$334.7	6.2	N.A.
1959.....	22.9	N.A.	505.4	4.5	N.A.
1960.....	18.2	N.A.	438.5	4.2	N.A.
1961.....	14.0	N.A.	405.4	3.5	N.A.
1962.....	14.4	N.A.	543.8	2.6	N.A.
1963.....	14.8	N.A.	515.7	2.9	N.A.
1964.....	19.9	\$3.5	588.4	3.4	0.6
1965.....	15.8	² 2.8	690.4	2.3	.4
1966.....	17.2	1.3	795.6	2.2	.2
1967.....	14.4	1.0	² 590.1	² 2.4	² 1.2
1968.....	² 14.7	² 1.5	² 563.4	² 2.6	² 1.3

¹ New supply consists of shipments plus imports.

² Estimated.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

**Table 3.—Principal Trading Partners
Truck Trailers—SIC 3715**

United States buys from—	United States sells to—
Canada United Kingdom West Germany Japan Mexico	Canada Bahamas Argentina Mexico Saudi Arabia Venezuela Guatemala

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment**Truck Trailers—SIC 3715**

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments	Establish- ments	Em- ployees	Ship- ments
1958.....	170	15,669	\$335	77	590	\$12	54	2,714	\$53	39	12,365	\$269
1963.....	197	19,429	516	92	602	13	60	3,156	67	45	15,671	435

Source: Bureau of the Census.

Table 5.—Key Ratios**Truck Trailers—SIC 3715**

Item	1958	1963
Investment per production worker.....	¹ \$5,015	\$6,200
Specialization ratio (%).....	84	92
Concentration ratios (%):		
4 firms.....	52	59
8 firms.....	63	69
20 firms.....	77	81
50 firms.....	93	93

¹ 1957.**Table 6.—Geographic Distribution, 1963****Truck Trailers—SIC 3715**

Geographic area	All em- ployees	Geographic area	All em- ployees
Total.....	19,429	South Atlantic.....	975
New England.....	101	East South Central.....	1,595
Middle Atlantic.....	3,891	West South Central.....	2,041
New York.....	184	Mountain.....	478
New Jersey.....	152	Pacific.....	2,191
Pennsylvania.....	3,555	Oregon.....	227
East North Central.....	5,961	California.....	1,641
Michigan.....	168		
West North Central.....	2,196		
Iowa.....	380		

Table 7 not relevant to SIC 3715.

Tufted Carpets and Rugs

SIC 2272

The tufted carpets and rugs industry is one of the most rapidly growing industries. Value of shipments increased 280 percent to \$1.2 billion between 1958 and 1966. Total employment increased 145 percent to 28,212, and capital expenditures increased 236 percent to \$26.9 million during this period.

About 60 percent of all domestically produced tufted carpets and rugs are manufactured in Georgia.

GROWTH FACTORS

Technological developments are the primary factor underlying both the establishment and the rapid growth of the tufted carpets and rugs industry. Before the development of carpet tufting machines, most domestically produced carpets and rugs were woven on looms. Carpet weaving is a slow and expensive process, and the cost of woven floor coverings restricted their market. Carpet tufting machines operate at high speeds and output per machine hour is greater than is possible with carpet looms.

Because manufacturing costs per square yard are lower for tufted than for woven floor coverings, the producers of tufted carpets and rugs can price their products substantially below those of woven carpets and rugs.

In the early phases of its development, the tufted carpet and rug industry relied heavily on the new markets that its relatively low-priced floor coverings were able to create. Early growth of the tufted carpet industry was based almost entirely on the low cost of the tufting process.

In recent years, the industry has broadened its market by improving product quality. Technology in the tufting process has developed rapidly, and the new types of tufted floor coverings introduced

offer most—if not all—of the qualities long associated only with woven carpets and rugs.

Tufting machines used by the industry produce floor coverings in a wide range of colors, patterns, textures, and pile densities.

As the quality of tufted floor coverings improve, tufted goods are displacing woven carpets and rugs. For products of similar quality, tufting is still substantially less expensive. This displacement has occurred at a rapid rate and is an important reason for the growth of the tufted carpet industry. Technological improvements in tufting equipment are the essential factor in this development.

A second factor in improved quality of tufted carpets and rugs is the use of a larger variety of fibers. Cotton used to be the predominant fiber used. Later, rayon was used extensively. Non-cellulosic man-made fibers currently account for nearly two-thirds of the face yarns used in tufted floor coverings.

The introduction of bulked, continuous filament carpet nylon was a milestone in the rapid expansion of tufted carpeting. With nylon, manufacturers could create a wide variety of colors and styles. Currently, acrylics, olefins, and polyesters make it possible to broaden the range of useful qualities of tufted floor coverings.

The improved qualities and low cost of tufted carpets and rugs have broadened the market for soft-surfaced floor coverings. In residential housing, wall-to-wall carpeting is increasingly favored by both homeowners and apartment dwellers. Carpeting is now being used in kitchens, bathrooms, porches, and patios.

In nonresidential construction, an area in which hard surfaced floorings once predominated, tufted floor coverings are rapidly gaining favor. Schools,

auditoriums, and even supermarkets now install carpeting.

Foreign trade data on tufted carpets and rugs are confined to import figures beginning in 1964. Before 1964 there were no separate import classifications for tufted floor coverings. Exports of tufted floor coverings are still not reported separately.

The available statistics show that imports are less than 1 percent of new supply. Even though no export figures are available, it is believed that exports of tufted floor coverings are small.

Indications are that imports and exports will remain small. The technological leadership which domestic producers have enjoyed will probably be of less significance in the future since the production of tufted floor coverings is increasing rapidly abroad.

However, carpet tufting is not a labor intensive process, and the domestic industry may remain competitive with foreign producers. The rapid growth in the foreign production of tufted carpets and rugs indicates that the market for U.S. exports is not likely to increase substantially.

FUTURE PROSPECTS

Prospects for future growth of the tufted carpets and rugs industry are good. It is not

expected however, that growth will continue indefinitely at its past rate. Displacement of woven floor coverings, which has been such an important growth factor in the past, will be of less consequence in the future as tufted products now account for more than 85 percent of the total yardage of soft-surfaced floor coverings currently produced.

Rising consumer incomes and population growth should increase the demand for floor coverings. And there is no indication that consumer preference for soft-surfaced floor coverings is decreasing.

In addition, the growth of carpeting in non-residential construction is likely to expand further. One major manufacturer of carpet fibers has established standards for commercial carpeting which permit the maker to guarantee carpeting against surface wear for a specified period.

The Federal Housing Administration and the Veterans Administration permit the cost of wall-to-wall carpeting to be included in mortgages. Financial institutions making home and commercial building loans are expected to follow suit.

The manufacturers of hard-surface floor coverings are following the traditional carpet weavers, into the tufting industry.

All of these events point to a continued robust growth of the tufted carpets and rugs industry.

**Table 1.—General Statistics
Tufted Carpets and Rugs—SIC 2272**

Year	Total employment		Production workers			Value added (\$1,000)	Value shipments (\$1,000)	Capital expenditures (\$1,000)	Value added per dollar of wages (\$)	Wages per production worker man-hour (\$)
	Number	Payroll (\$1,000)	Number	Man-hours (1,000)	Wages (\$1,000)					
1958.....	11,528	36,313	9,880	19,532	26,936	108,846	317,639	8,007	4.041	1.379
1959.....	12,487	41,476	10,688	21,454	30,776	125,479	364,354	6,639	4.077	1.435
1960.....	13,272	46,630	11,320	23,548	34,261	147,132	436,934	6,920	4.294	1.455
1961.....	14,937	55,069	12,327	26,082	39,366	182,931	549,886	10,245	4.647	1.509
1962.....	17,528	70,724	14,652	32,072	51,576	248,733	791,896	11,897	4.823	1.608
1963.....	19,854	80,470	17,188	36,359	61,312	259,343	801,804	11,512	4.230	1.686
1964.....	24,852	104,094	20,204	44,282	77,755	325,450	1,043,279	N.A.	4.186	1.756
1965.....	26,371	121,834	22,326	50,196	92,140	362,534	1,121,257	27,027	3.935	1.836
1966.....	28,212	132,838	23,504	51,477	98,928	398,178	1,206,422	26,906	4.025	1.922
1967.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 2.—Foreign Trade
Tufted Carpets and Rugs—SIC 2272

[Dollars in millions]

Year	Exports	Imports	Product shipments	Exports as a percent of shipments	Imports as a percent of new supply ¹
1958.....	N.A.	N.A.	\$317.6	N.A.	N.A.
1959.....	N.A.	N.A.	364.4	N.A.	N.A.
1960.....	N.A.	N.A.	436.9	N.A.	N.A.
1961.....	N.A.	N.A.	549.9	N.A.	N.A.
1962.....	N.A.	N.A.	791.9	N.A.	N.A.
1963.....	N.A.	N.A.	801.8	N.A.	N.A.
1964.....	N.A.	\$6.0	1,043.3	N.A.	.6
1965.....	N.A.	7.4	1,121.3	N.A.	.7
1966.....	N.A.	10.9	1,206.4	N.A.	.9
1967.....	N.A.	² 9.9	N.A.	N.A.	N.A.
1968.....	N.A.	N.A.	N.A.	N.A.	N.A.

¹ New supply consists of shipments plus imports.

² Preliminary.

N.A.=Not available.

Source: Bureau of the Census and BDSA.

Table 3.—Principal Trading Partners
Tufted Carpets and Rugs—SIC 2272

United States buys from—

United States sells to—

Canada	N.A.
Belgium	
Italy	
Japan	

N.A.=Not available.

Source: Bureau of the Census.

Table 4.—Number of Employees by Size of Establishment
Tufted Carpet and Rugs—SIC 2272

[Dollars in millions]

Year	Total			1-19			20-99			100 and over		
	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments	Establishments	Employees	Shipments
1958.....	92	11,528	\$318	20	184	\$5	38	2,179	\$64	34	9,165	\$249
1963.....	181	19,854	802	60	408	13	63	3,208	148	58	16,238	641

Source: Bureau of the Census.

Table 5.—Key Ratios
Tufted Carpets and Rugs—SIC 2272

Item	1963
Investment per production worker.....	\$6,726
Specialization ratio (%).....	96
Concentration ratios (%):	
4 firms.....	25
8 firms.....	41
20 firms.....	65
50 firms.....	87

Source: Bureau of the Census.

Table 6.—Geographic Distribution, 1963
Tufted Carpets and Rugs—SIC 2272

Geographic area	All employees	Geographic area	All employees
Total.....	19,854	South.....	16,091
Northeast and North		South Carolina.....	1,587
Central.....	2,337	Georgia.....	12,260
Pennsylvania.....	1,518	Pacific.....	1,426
		California.....	1,426

Source: Bureau of the Census.

Table 7 is not relevant to SIC 2272.

Appendix A

INDUSTRY DEFINITIONS

2011 Meat Packing Plants—Establishments primarily engaged in the slaughtering, for their own account or on a contract basis for the trade, of cattle, hogs, sheep, lambs, calves, horses, and other animals except small game, for meat to be sold or to be used on the same premises in canning and curing, and in making sausage, lard, and other products. Establishments primarily engaged in manufacturing sausages and meat specialties from purchased meats are classified in industry 2013; and establishments primarily engaged in killing, dressing, packing, and canning poultry, rabbits, and other small game in industry 2015.

Some slaughtering operations are conducted in establishments which are not included in the census of manufactures, such as those chiefly engaged in wholesale or retail trade, locker plant services, etc. A check of the 1958 Census of Manufactures records with those of the U.S. Department of Agriculture indicated that the census of manufactures included about 90 percent of the volume of commercial livestock slaughter. A similar comparison of the 1963 census slaughter statistics with those of the U.S.D.A. indicates that coverage of commercial slaughter is about at the same level.

2037 Frozen Fruits, Fruit Juices, Vegetables and Specialties—Establishments primarily engaged in quick freezing and cold packing (freezing) fruits, fruit juices, vegetables, and specialties. Excluded from this industry are establishments primarily engaged in packing fruits and vegetables for freezing but not freezing the product; cold storage warehouses freezing foods for others, frozen food locker and other establishments freezing for individual consumers or farms and ranches producing frozen fruits and vegetables. Establishments primarily freezing meats and poultry are included in Industry Group 201, Meat Products.

2256 Knit Fabric Mills—Establishments primarily engaged in knitting tubular or flat fabric, and in dyeing or finishing knit fabric.

2272 Tufted Carpets and Rugs—Establishments primarily engaged in tufting carpets and rugs from any textile fiber. Important products of this industry include tufted carpets, rugs, scatter rugs, and bathmats and bathmat sets except terry woven. Finishers of these products also are included in this industry.

2522 Metal Office Furniture—Establishments primarily engaged in manufacturing metal office furniture, whether padded or plain. Establishments primarily engaged in manufacturing safes and vaults are classified in industry 3492.

2621 Paper Mills, Except Building Paper Mills—Establishments primarily engaged in manufacturing paper (except building paper—industry 2661) from wood pulp and other fibers, and which may also manufacture converted paper products (confined almost exclusively to off-machine paper coating). Pulp mills combined with paper mills, and not separately reported, are also included in this industry; where separately reported, they are classified in industry 2611. Establishments primarily engaged in manufacturing converted paper products from purchased paper stock are classified in Industry Group 264 or 265.

2653 Corrugated and Solid Fiber Boxes—Establishments primarily engaged in manufacturing corrugated and solid fiber boxes and related products from purchased paperboard of fiber stock. Important products of this industry include corrugated and solid fiberboard boxes, pads, partitions, display items, pallets, single face products, and corrugated sheets.

2655 Fiber Cans, Tubes, Drums, and Similar Products—Establishments primarily engaged in manufacturing fiber cans, cones, drums, and similar products with or without metal ends, from purchased materials; and vulcanized fiber boxes.

2711 Newspapers: Publishing, Publishing and Printing—Establishments primarily engaged in publishing newspapers, or in publishing and printing newspapers. These establishments carry on the various operations necessary for issuing newspapers, including the gathering of news, and the preparation of editorials and advertisements, but may or may not perform their own printing. Commercial printing is frequently carried on by establishments engaged in publishing and printing newspapers, but even though the commercial printing may be of major importance such establishments are included in this industry.

Establishments not engaged in publishing newspapers, but which print or lithograph newspapers for publishers, are classified in industry 2751 or industry 2752. News syndicates are classified in service industries. Establishments primarily engaged in publishing shopping news are classified in industry 2741.

Publications have been classified as periodicals (industry 2721) rather than as newspapers if their news and editorial presentations are not typically directed to the public at large. Where the news is of general interest publications are considered periodicals if they are not the primary printed source of such news. Among the types of publications sometimes considered newspapers, but treated in the census as periodicals, are the following: trade journals; house organs, local church or school papers and like publications with very limited or specialized newstreatment. Generally, publications issued by nonprofit organizations (educational, religious, charitable, labor, business, professional, etc.) are classified as periodicals, as are magazine and comic supplements for Sunday newspapers.

2731 Books: Publishing, Publishing and Printing—Establishments primarily engaged in publishing only, or in publishing and printing books and pamphlets. Establishments primarily engaged in printing, or in printing and binding (but not publishing) books and pamphlets are classified in industry 2732.

Industry 2731 also includes data on book publishing activities obtained from nonprofit organizations whose employees are covered under the Social Security System and were able to report their book publishing operations as a separate establishment.

2732 Book Printing—Establishments primarily engaged in printing only or in printing and binding books and pamphlets, but not in publishing. Establishments primarily engaged in publishing, or in publishing and printing books and pamphlets, are classified in industry 2731. Establishments engaged in both printing and binding books, but primarily binding books printed elsewhere, are classified in industry 2789.

Establishments classified in industry 2732 are similar in character to some establishments primarily engaged in commercial letterpress printing (industry 2751) and in commercial lithography (industry 2752). The distinction is that the establishments classified in industry 2732 derive the greater part of their revenue from printing books and pamphlets, while such operations are secondary activities for establishments classified in industries 2751 and 2752.

2752 Commercial Printing, Lithographic—Establishments primarily engaged in printing by the lithographic process. The greater part of the work in this industry is performed on a job or custom basis; but in some cases lithographed calendars, maps, posters, decalcomanias, etc., are made for sale. Offset printing, photo-offset printing, and photolithography are also included in this industry. Establishments primarily engaged in lithographing books and pamphlets, without publishing, are classified in industry 2732, and greeting cards in industry 2771.

2761 Manifold Business Forms Manufacturing—Establishments primarily engaged in designing and printing, by any process, special forms for use in the operation of a business, in single and multiple sets, including carbonized or interleaved with carbon or otherwise processed for multiple reproduction. The principal types of manifold

business forms are continuous, unit-set, and salesbooks.

2818 Industrial Organic Chemicals, N.E.C.—Establishments primarily engaged in manufacturing industrial organic chemicals, n.e.c. Important products of this industry include: (1) noncyclic organic chemicals such as acetic, chloroacetic, adipic, formic, oxalic and tartaric acids and their metallic salts; chloral, formaldehyde and methylamine; (2) solvents such as amyl, butyl and ethyl alcohols; methanol; amyl, butyl and ethyl acetates; ethyl ether, ethylene glycol ether and diethylene glycol ether; acetone, carbon disulfide and chlorinated solvents such as carbon tetrachloride, perchloroethylene and trichloroethylene; (3) polyhydric alcohols such as ethylene glycol, sorbitol, pentaerythritol; (4) synthetic perfume and flavoring materials such as coumarin, methyl salicylate, saccharin, citral, citronellal, synthetic geraniol, ionone, terpineol, and synthetic vanillin; (5) rubber processing chemicals such as accelerators and antioxidants, both cyclic and acyclic; (6) plasticizers, both cyclic and acyclic; such as esters of phosphoric acid, phthalic anhydride, adipic acid, lauric acid, oleic acid, sebacic acid, and stearic acid; (7) synthetic tanning agents such as naphthalene sulfonic acid condensates; (8) chemical warfare gases; and (9) esters, amines, etc. of polyhydric alcohols and fatty and other acids. Establishments primarily engaged in manufacturing plastic materials and nonvulcanizable elastomers are classified in industry 2821; synthetic rubber in industry 2822; essential oils in industry 2899; wood distillation products, naval stores, and natural dyeing and tanning materials in Industry Group 286; rayon and other synthetic fibers in industries 2823 and 2824; specialty cleaning, polishing and sanitation preparations in Industry 2842; and paints and pigments in Industry Group 285. Distilleries engaged in the manufacture of grain alcohol for beverage purposes are classified in industry 2085.

2821 Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers—Establishments primarily engaged in manufacturing synthetic resins, plastics materials, and nonvulcanizable elastomers. Important products of this industry include: cellulose plastic materials; phenolic and other tar acid resins; urea and melamine resins; vinyl resins; styrene resins; alkyd resins; acrylic resins; polyethylene resins; rosin modified resins; coumarone-indene and petroleum polymer resins; and miscellaneous resins, including polyamid resins, silicones, polyisobutylenes, polyesters; vulcanized fiber; casein plastics; and regenerated cellulose. This classification does not include nonchemical manufacturers who merely purchase resin or plastics materials to produce fabricated plastics products, film, and sheets, classified in industry 3079.

2822 Synthetic Rubber (Vulcanizable Elastomers)—Establishments primarily engaged in manufacturing synthetic rubber by polymerization or copolymerization. An elastomer for the purpose of this classification is a rubber-like material capable of vulcanization, such as copolymers of butadiene and styrene, or butadiene and acrylonitrile, polybutadienes, chloroprene rubbers, and isobutylene-isoprene copolymers. Butadiene copolymers containing less than 50% butadiene are

- classified in industry 2821. Chlorinated rubber and cyclized rubbers are considered as semi-finished products, and are classified in industry 3069.
- 2824 Synthetic Organic Fibers, Except Cellulosic**—Establishments primarily engaged in manufacturing synthetic organic fibers except cellulosic (including those of regenerated proteins, and of polymers or copolymers of such components as vinyl chloride, vinylidene chloride, linear esters, vinyl alcohols, acrylonitrile, ethylenes, amides, and related polymeric materials) in the form of monofilament, yarn, staple or tow suitable for further manufacturing on spindles, looms, knitting machines or other textile processing equipment. Establishments primarily engaged in manufacturing textile glass fibers are classified in industry 3229.
- 2834 Pharmaceutical Preparations**—Establishments primarily engaged in manufacturing, fabricating, or processing drugs into pharmaceutical preparations for human or veterinary use. The greater part of the products of these establishments are finished in the form intended for final consumption, such as tablets, capsules, ointments, solutions and suspensions. Products of this industry consist of two important lines, namely, (1) pharmaceutical preparations primarily advertised or otherwise promoted to or prescribed by the health professions: medical, dental, pharmaceutical, nursing, etc.; and (2) pharmaceutical preparations primarily advertised or otherwise promoted to the general public. Establishments compounding drugs and medicines and selling these "over the counter" are classified in trade industries.
- 2844 Perfumes, Cosmetics, and Other Toilet Preparations**—Establishments primarily engaged in manufacturing perfumes (natural and synthetic), cosmetics and other toilet preparations. This industry also includes establishments primarily engaged in blending and compounding perfume bases; and those manufacturing shampoos and shaving products, whether from soap or synthetic detergents. Establishments primarily engaged in manufacturing synthetic perfume and flavoring materials are classified in industry 2818, and essential oils in industry 2899.
- 2911 Petroleum Refining**—Establishments primarily engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants and other products from crude petroleum, and its fractionation products either through straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking or other processes. Establishments primarily engaged in producing natural gasoline from natural gas are classified in mining industries. Those manufacturing lubricating oils and greases by blending and compounding purchased materials are included in industry 2992.
- 3079 Miscellaneous Plastics Products**—Establishments primarily engaged in molding primary plastics for the trade, in manufacturing film, sheets, sheeting, rods, tubes, and other stock shapes from purchased resins, and in fabricating miscellaneous finished plastics products. Establishments primarily engaged in manufacturing plastics materials in the form of sheets, rods, tubes, granules, powders, or liquids made from resins produced in the same establishment are classified in industry 2821, and those primarily engaged in manufacturing artificial leather in industry 2295.
- 3312 Blast Furnaces (Including Coke Ovens), Steel Works and Rolling Mills**—Establishments primarily engaged in manufacturing hot metal, pig iron, silvery pig iron, and ferroalloys from iron ore and iron and steel scrap; converting pig iron, scrap iron and scrap steel into steel; and in hot rolling iron and steel into basic shapes such as plates, sheets, strips, rods, bars and tubing. Merchant blast furnaces and byproduct or bee-hive coke ovens are also included in this industry. Included in this industry are all establishments engaged in the manufacture of blast furnace ferroalloys. However, establishments which manufacture ferro or nonferrous additive alloys by electrometallurgical process are classified in industry 3313. Also, establishments which draw wire from purchased rod and bar; establishments which perform only cold rolling, drawing or finishing operations; and establishments which produce welded, seamless, and heavy riveted pipe from purchased materials are not included in industry 3312, but are included in industries 3315, 3316, and 3317, respectively.
- 3323 Steel Foundries**—Establishments primarily engaged in manufacturing steel castings.
- 3334 Primary Production of Aluminum**—Establishments primarily engaged in producing aluminum from alumina, and in refining aluminum by any process. Establishments primarily engaged in rolling, drawing or extruding aluminum are classified in industry 3352.
- 3522 Farm Machinery and Equipment**—Establishments primarily engaged in manufacturing farm machinery, including equipment and wheel tractors, for use in the preparation and maintenance of the soil; planting and harvesting of the crop; preparing, on the farm, crops for market; or for use in performing other farm operations and processes. This industry includes wheel tractors, except contractors' off-highway type which are classified in industry 3531. Establishments primarily engaged in manufacturing industrial trucks, tractors, and trailers used for handling materials in industrial plants, depots, and docks are classified in industry 3537; and farm hand tools in Industry Group 342.
- 3531 Construction Machinery and Equipment**—Establishments primarily engaged in manufacturing heavy machinery and equipment used by the construction industries, such as bulldozers; concrete mixers; cranes, except industrial plant; dredging machinery; pavers, and power shovels. Establishments primarily engaged in manufacturing mining equipment are classified in industry 3532, and well drilling machinery in industry 3533.
- 3534 Elevators and Moving Stairways**—Establishments primarily engaged in manufacturing passenger or freight elevators, automobile lifts, dumb waiters, and moving stairways. Establishments primarily engaged in manufacturing commercial conveyor systems and equipment are classified in industry 3535, and farm elevators in industry 3522.
- 3537 Industrial Trucks, Tractors, Trailers, and Stackers**—Establishments primarily engaged in manufacturing industrial trucks, tractors, trailers, stackers (truck type), and related equipment,

used for handling materials on floors and paved surfaces in and around industrial and commercial plants, depots, docks, and terminals. Establishments primarily engaged in manufacturing motor vehicles and motor vehicle type trailers are classified in Industry Group 371; farm type wheel tractors in industry 3522; wheel tractor shovel loaders, tracklaying tractors in industry 3531; and wood pallets and skids in industry 2499.

3541 Machine Tools, Metal Cutting Types—Establishments primarily engaged in manufacturing power-driven machines, not supported in the hands of an operator when in use, that shape metal by cutting or use of electrical equipment; the rebuilding of such machine tools, and the manufacture of replacement parts for them. Metalworking, or primarily metalworking, machine tools designed primarily for home workshops are also included. Establishments primarily engaged in the manufacture of electric welding equipment are classified in industry 3623; and portable powerdriven hand tools, gas welding and cutting equipment, and automotive maintenance equipment in industry 3548.

3544 Special Dies and Tools, Die Sets, Jigs, and Fixtures—Establishments primarily engaged in manufacturing, on a job or order basis, special tools and fixtures for use with machine tools, hammers, die casting machines, and presses. The products of establishments classified in this industry include a wide variety of special toolings, such as dies; punches; die sets and components, and subpresses; jigs and fixtures; and special checking devices. Establishments primarily engaged in manufacturing metal molds for casting metals, for rubber working, plastic working, glass working and similar machinery are also included.

This industry comprises establishments commonly known as contract tool and die shops; also included are captive tool and die shops of metal-products producers, where such shops were separately operated and separate reports were filed. However, the total value of shipments excludes the captive production of tool and die departments making these products for the exclusive use of the producing establishment.

3552 Textile Machinery—Establishments primarily engaged in manufacturing machinery for the textile industries, and extra parts, attachments, and accessories. Establishments primarily engaged in manufacturing domestic or industrial sewing machines are classified in industry 3636.

3564 Blowers, Exhaust and Ventilating Fans—Establishments primarily engaged in manufacturing blowers, and exhaust and ventilating fans for general industrial, commercial, and household use. Establishments primarily engaged in manufacturing complete air conditioning units are classified in industry 3585, and free air circulating fans for use on desks, pedestals, or wall brackets in industry 3634.

3564 Industrial Gas Cleaning Equipment—Industrial gas cleaning equipment includes: air purification and dust collecting equipment; industrial dust and fume collecting equipment; air filters; electrostatic precipitators.

3571 Computing and Accounting Machines, Including Cash Registers—Establishments primarily en-

gaged in manufacturing computing machines including electronic, accounting machines, and cash registers. Establishments primarily engaged in manufacturing typewriters are classified in industry 3572, and office duplicating machines and devices and autographic registers in industry 3579.

3581 Automatic Merchandising Machines—Establishments primarily engaged in manufacturing automatic merchandising units, also referred to as vending machines (excluding music, amusement, or gaming machines) and coin-operated mechanisms for such machines. Coin-operated amusement and gaming machines are classified in industry 3999 and coin-operated phonographs in industry 3651.

3585 Refrigerators and Refrigeration Machinery, Except Household; and Complete Air-Conditioning Units—Establishments primarily engaged in manufacturing equipment and systems utilizing the basic refrigeration cycle, including mechanical and absorption refrigerators for commercial and industrial use; refrigeration machinery, and complete air-conditioning units for domestic, commercial, and industrial use. Establishments primarily engaged in manufacturing soda fountain and beer-dispensing equipment are classified in this industry, and those primarily engaged in manufacturing household refrigerators and home and farm freezers in industry 3632.

3622 Industrial Controls—Establishments primarily engaged in manufacturing motor starters and controllers, control accessories, electronic controls, and other industrial controls. Establishments primarily engaged in manufacturing automatic temperature controls are classified in industry 3822.

3634 Electric Housewares and Fans—Establishments primarily engaged in manufacturing electric housewares for heating, cooking, and other purposes; and electric fans. Important products of this industry include electric air heaters, bed coverings, blenders, broilers, deep fat fryers, flat irons, food mixers, hot plates, percolators and coffee makers, roasters, toasters, desk and bracket fans, and hassock or floor fans.

3651 Radio and Television Receiving Sets, Except Communication Types—Establishments primarily engaged in manufacturing equipment for home entertainment. This industry also includes establishments primarily engaged in manufacturing public address systems, and music distribution apparatus, except records. Establishments primarily engaged in manufacturing records are classified in industry 3652; radio and television receiving type tubes in industry 3671; and television receiving type cathode ray tubes in industry 3672.

3661 Telephone and Telegraph Apparatus—Establishments primarily engaged in manufacturing wire telephone and telegraph equipment and parts especially designed for telephone and telegraph use.

3662 Radio and Television Transmitting, Signaling, and Detection Equipment and Apparatus—Establishments primarily engaged in manufacturing (1) radio and television broadcasting equipment; (2) electric communication equipment and parts, except telephone and telegraph; (3) electronic field detection apparatus, light and heat emission

operation apparatus, object detection apparatus and navigational electronic equipment, and aircraft and missile control systems; and (4) other electric and electronic communication and signaling products, n.e.c. Establishments primarily engaged in manufacturing transmitting tubes are classified in industry 3673.

3672 Cathode Ray Picture Tubes—Establishments primarily engaged in manufacturing television receiving type cathode ray tubes. Establishments primarily engaged in manufacturing other radio and television receiving type electron tubes are classified in industry 3671; and transmitting tubes in industry 3673.

3674 Semiconductor (Solid State) and Related Devices—Establishments primarily engaged in manufacturing semiconductor (solid state) and related devices, such as semiconductor diodes and stacks, including rectifiers; transistors; solar cells; and light sensitive semiconductor (solid state) devices.

3713 Truck and Bus Bodies—Establishments primarily engaged in the manufacture of truck and bus bodies, for sale separately or for assembly on purchased chassis. Establishments primarily engaged in manufacturing complete trucks and busses are classified in industry 3717, and stamped body parts for trucks and busses in industry 3461.

3715 Truck Trailers—Establishments primarily engaged in the manufacture of truck trailers and truck trailer chassis for sale separately, but not engaged in manufacturing complete trucks and busses. Establishments primarily engaged in manufacturing trailer bodies are classified in industry 3713. Those primarily engaged in manufacturing passenger car trailers are classified in industry 3799; and those primarily engaged in manufacturing trailer coaches are classified in industry 3791.

3717 Motor Vehicles and Parts—Establishments primarily engaged in manufacturing or assembly of complete passenger automobiles, car bodies, trucks, commercial cars and busses (except trackless trolleys, industry 3742), special purpose motor vehicles such as ambulances, fire engines, taxicabs, scout cars, personnel carriers, amphibian motor vehicles, and selected parts and accessories for motor vehicles. Establishments primarily engaged in manufacturing motor vehicles on purchased chassis (ambulances, fire engines, etc.) are classified in industry 3713.

In the 1963 Census of Manufactures, as in 1958, the three SIC industries (3711, 3712, and 3714) have been combined because of a major problem of defining the reporting unit in terms of these industries. This difficulty arises from the fact that many large establishments have integrated operations which include the production of parts or bodies and the assembly of complete vehicles at the same location.

Included in industry 3717 are such parts as passenger-car bodies, motor vehicle engines (except diesel), brakes, clutches, axles, radiators, differentials, transmissions, wheels and frames, windshield wipers, automotive bumpers, camshafts, connecting rods, crankshaft assemblies, cylinder heads, drive shafts, exhaust systems, fuel systems, heaters, hoods, horns, instrument board assemblies, lubrication systems, mufflers, power-transmission equipment, rear-axle hous-

ings, shock absorbers, steering mechanisms, universal joints, wheel rims, windshield frames, and automobile accessories, n.e.c.

A considerable number of components, parts, and accessories for motor vehicles are not classified in industry 3717 but are classified in other Standard Industrial Classification industries based on the characteristic of the product itself rather than the use to which it is put. Among the more important of these are automotive hardware, industry 3429; automotive stampings, industry 3461; diesel and semidiesel engines, industry 3519; sealed beam and other electric lamps, industry 3641; motor vehicle lighting fixtures, industry 3642; tire and inner tubes, industry 3011; automobile glass, industry 3211; ignition equipment such as spark plugs, distributors, switches, ignition coils, generators, cranking motors, etc., industry 3694; storage batteries, industry 3691; automobile radios, industry 3651; and carburetors and pistons, industry 3599.

3721 Aircraft—Establishments primarily engaged in manufacturing or assembling complete aircraft. This industry includes establishments primarily engaged in factory type aircraft modification on a contract or fee basis. Establishments primarily engaged in manufacturing engines, propellers, and other aircraft parts and auxiliary equipment are classified in industries 3722, 3723, and 3729.

3732 Boat Building and Repairing—Establishments primarily engaged in building and repairing of boats, except rubber boats (industry 3069). Establishments primarily engaged in cleaning and storing boats and the rental of dock space, and yacht clubs are classified in nonmanufacturing industries.

3742 Railroad and Street Cars—Establishments primarily engaged in building and rebuilding railroad, street, and rapid transit cars and car equipment for operation on rails for freight and passenger service. This industry also includes establishments primarily engaged in manufacturing trackless trolley busses. Establishments primarily engaged in manufacturing mining cars are classified in industry 3532. Repair shops owned and operated by railroad or local transit companies, rebuilding or repairing cars, or building new cars for their own account, are classified in Major Groups 40 and 41.

3791 Trailer Coaches, Housing Type—Establishments primarily engaged in manufacturing trailer coaches (mobile dwellings) for attachment to passenger cars and pick-up coaches (campers) for mounting on pick-up trucks.

3821 Mechanical Measuring and Controlling Instruments Except Automatic Temperature Controls—Establishments primarily engaged in manufacturing industrial process instruments for indicating, recording, measuring and controlling temperature (except automatic temperature controls, industry 3822), pressure and vacuum, fluid flow and liquid level, mechanical motion, rotation, humidity, density, acidity, alkalinity and combustion; dial pressure gauges; physical property testing apparatus such as hardness, tension, compression, torsion, ductility, elasticity testing apparatus.

3831 Optical Instruments and Lenses—Establishments primarily engaged in the production of optical

lenses and prisms, and in manufacturing optical instruments such as microscopes, telescopes, field and opera glasses; and optical measuring and testing instruments such as refractometers, spectrometers, spectroscopes, colorimeters, polariscopes. Establishments primarily engaged in manufacturing eyeglass lenses, frames, or fittings are classified in industry 3851; and those engaged in manufacturing sighting and fire control instruments, but not engaged in manufacturing optical components, in industry 1941.

3841 Surgical and Medical Instruments and Apparatus—Establishments primarily engaged in manufacturing medical, surgical, ophthalmic, and veterinary instrument and apparatus. Establishments primarily engaged in manufacturing surgical and orthopedic appliances are classified in industry 3842; and electrotherapeutic, electromedical, and X-ray apparatus in industry 3693.

3842 Orthopedic, Prosthetic and Surgical Appliances and Supplies—Establishments primarily engaged in manufacturing orthopedic, prosthetic, and surgical appliances and supplies, arch supports, and other foot appliances; fracture appliances, elastic hosiery, abdominal supporters, braces, and trusses; bandages; surgical gauze and dressings; sutures; adhesive tapes and medicated plasters; and personal safety appliances and equipment. Establishments primarily engaged in manufacturing surgical and medical instruments are classified in industry 3841. Establishments primarily engaged in manufacturing appliances and in the personal fitting to the individual prescription of a physician are classified in trade industries.

3843 Dental Equipment and Supplies—Establishments primarily engaged in manufacturing artificial teeth, dental metals alloys and amalgams, and a wide variety of equipment, instruments, and supplies used by dentists, dental laboratories, and dental colleges. Dental laboratories constructing artificial dentures, bridges, inlays and other dental restorations on specifications from dentists are classified in service industries.

3861 Photographic Equipment and Supplies—Establishments primarily engaged in manufacturing (1)

photographic apparatus, equipment, parts, attachments, and accessories, such as still and motion picture cameras and projection apparatus; photocopy and microfilm equipment; blueprinting and diazotype (white printing) apparatus and equipment; and other photographic equipment; and (2) sensitized film, paper, cloth, and plates, and prepared photographic chemicals for use therewith. Establishments primarily engaged in manufacturing photographic paper stock (unsensitized) and paper mats, mounts, casels and folders for photographic use are classified in Major Group 26; photographic lenses in industry 3831; photographic glass in Major Group 32; chemicals for technical purposes, not specifically prepared and packaged for use in photography, in Major Group 28; and photographic flash, flood, enlarger and projection lamps in industry 3641.

3911 Jewelry (Precious Metal)—Establishments primarily engaged in manufacturing jewelry and other articles, worn on or carried about the person, made of precious metals with or without stones (including the setting of stones where stones are used), including cigarette cases and lighters, vanity cases and compacts; trimmings for umbrellas and canes; and jewel settings and mountings. Establishments primarily engaged in manufacturing costume jewelry from nonprecious metals and other materials are classified in industry 3961.

3941 Games and Toys, Except Dolls and Children's Vehicles—Establishments primarily engaged in manufacturing indoor games and game sets for adults and children, and mechanical and non-mechanical toys. Important products of this industry include games such as chess, checkers, dominoes, puzzles, and other indoor games; and toys, such as toy furniture, doll carriages and carts, construction sets, mechanical trains, toy guns and air rifles, and other mechanical games and toys. Establishments primarily engaged in manufacturing dolls are classified in industry 3942; children's outdoor wheel goods and vehicles, except bicycles, in industry 3943; and sporting and athletic goods for children and adults in industry 3949.

APPENDIX B

Glossary

SOURCES

The tabular data presented for each industry covered in *Pace Setters in American Industry* are from published Bureau of the Census sources, except as otherwise noted, for all years but 1967 and 1968. The sources of data for the respective tables are:

Table	Title	Source
1	General Statistics	1963 <i>Census of Manufactures</i> ; 1965 and 1966 <i>Annual Survey of Manufactures</i> ; BDSA estimates for 1967 and 1968.
2	Foreign Trade	<i>Exports and Imports as Related to Output, 1965 and 1964</i> ; BDSA estimates for 1966, 1967, and 1968.
3	Principal Trading Partners	<i>FT-410 U.S. Exports</i> ; <i>FT-135 U.S. Imports</i> .
4	Number of Employees by Size of Establishment	1933 <i>Census of Manufactures</i> .
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THE STANDARD INDUSTRIAL CLASSIFICATION (SIC)

Data in tables 1, 4, 5, and 6 of this volume are classified within the framework of the Bureau of

the Budget *Standard Industrial Classification* (SIC) of 1957. The purpose of the SIC is to provide a means for classifying establishments according to their primary activities, for the purpose of collection, tabulation, presentation and analyses of data relating to establishments.

The SIC identifies four-digit manufacturing industry codes in the following manner:

1. The first two digits identify the general type of activity; e.g., the code 20 refers to the manufacture of "Food and Kindred Products."

2. The third digit identifies a subgroup within the general type of activity, e.g. 201 represents "Meat Products."

3. The fourth digit identifies a specific industry within each subgroup, e.g. 2011 identifies "Meat Slaughtering Plants," 2013 "Meat Processing Plants," and 2015 "Poultry Dressing Plants."

In the *Annual Survey* and *Census of Manufactures*, each manufacturing establishment is assigned a four-digit code which reflects the primary activity of that establishment. The data shown in tables 1, 4, 5, and 6 represent totals for establishments classified with the same SIC code (i.e., the same four digits).

PRODUCT CLASSES

To provide more detailed information on product shipments, the Census Bureau has added a fifth digit to the four-digit SIC code described above. Continuing the above example, within the four-digit industry classification 2011 for "Meat Slaughtering Plant Products," the Census Bureau has developed a series of product classes such as:

20111 "Beef, Fresh and Frozen"
20112 "Veal, Fresh and Frozen"

20113 "Lamb and Mutton, Fresh and Frozen"

20114 "Pork, Fresh and Frozen."

The data in table 7 are reported, with some modification, on the basis of the five-digit product class codes.

It is essential to note that the product class codes differ from the SIC, in that their purpose is not to classify establishments but rather to classify product groups. The codes assigned to these product classes are based on the industries to which they are primary. Data reported on a product-class basis reflect the total shipments of products (wherever made), rather than the characteristics of establishments that are primarily engaged in making those products.

In table 2, data are shown on a four-digit "product group" basis. While the code and description are identical to the SIC, the data shown are "product" as opposed to "industry" data. The shipments data represent totals of the five-digit product class shipments, within a four-digit group. The export and import data are converted from the *Schedule B* and *Tariff Schedule of the United States, Annotated* (TSUSA) to conform as closely as possible to the primary products defined within each four-digit group.

MODIFICATION OF PRODUCT CLASS CODES

In table 7 certain modifications have been made in the product classes developed by the Census Bureau in order to:

1. Adjust for changes in product class definitions since 1958, and
2. Adjust for the fact that similar products are produced in and are defined as primary to more than one industry.

The first type of adjustment was made in those cases where more detailed product classes have been established since 1958. In this publication, the data for the new product classes have been combined, in order to present comparable data since 1958 rather than for just 1965 and 1966. A five-digit code ending in "A," "B," or "C" identifies this type of combination.

The second type of adjustment was made in those cases where the same product class is primary to more than one industry. For example, sausage is a primary product of both meat slaughtering plants and meat processing plants. In this publication, total shipments of sausage would be shown under each industry.

These two types of modifications have been carried out in order to present comparable data for all years, 1958 to 1966, and to show data, to the greatest degree possible, on a wherever made basis.

DEFINITIONS

Table 1 presents data on employment, payroll, production workers, wages, man-hours, value added, value of shipments, capital expenditures, value added per dollar of wages, and wages per production worker man-hour. The definitions of these terms are as follows:

Total Employment: All full-time and part-time employees on the payrolls of operating manufacturing establishments who worked or received pay for any part of the pay period ended nearest the 15th of selected months. Included are all persons on paid sick leave, paid holidays, and paid vacations during these pay periods. Excluded are members of the Armed Forces and pensioners carried on the active rolls but not working during the period. All plant employees, including plant officials, are included except proprietors and partners of unincorporated firms.

Total employment generally consists for "production workers" of an average of four monthly figures for March, May, August, and November plus for "all other employees" the mid-March figure.

Payroll: This total represents gross wages and salaries paid in the calendar year to all employees on the payroll of operating manufacturing establishments, following the definition of payrolls used for calculating the Federal withholding tax. Included are all forms of compensation, such as salaries, wages, commissions, dismissal pay, all bonuses, vacation and sick leave pay, and compensation in kind, prior to such deduction as employees' social security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of these establishments, if a corporation; it excludes payments to the proprietor or partners, if an unincorporated concern. Also excluded are payments to members of the Armed Forces and pensioners carried on the active payrolls of manufacturing establishments.

Production Workers: All workers (up through the working foreman level) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, jani-

torial, watchman services, product development, auxiliary production for plants' own use (e.g., power plant) record keeping, and other services closely associated with these production operations at the establishment covered by the report. Supervisory employees above the working foreman level are excluded from this category.

Production Worker Man-Hours: All plant man-hours of production workers as defined above, represents all man-hours worked or paid for at the plant including actual overtime hours (not straight-time equivalent hours). The total excludes hours paid for vacations, holidays, or sick leave, when the employee was not at the plant. Where employees elected to work during the vacation period, only actual hours worked by such employees were reported.

Wages: Gross earnings paid in the calendar year to all production workers on the payrolls of operating manufacturing establishments.

Value Added: This measure is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments of products manufactured plus receipts for services rendered. The result of this calculation is then adjusted by the addition of value added by merchandising operations (that is, the difference between the sales value and cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process inventories between the beginning and end of the year.

"Value added" avoids the duplication in the "value of shipments" figure which results from the use of products of some establishments as materials by others. Consequently, it is useful for comparing the relative economic contribution of the manufacturing process among industries and geographic areas.

Value of Shipments: Dollar amounts of the received or receivable net selling values, f.o.b. plant, after discounts and allowances, and excluding freight charges and excise taxes. However, where the products of an industry are customarily delivered by the manufacturing establishment (e.g., bakery products, fluid milk, and soft drinks), the value of shipments is based on the delivered prices of the goods.

Value of production data rather than shipments are collected in several instances where value of shipments does not provide a good measure of activity, and where information regarding the value of production is readily reportable. For

certain large leadtime products (e.g., aircraft) value of work done is substituted.

The value of shipments shown for a product class may differ from the value of production of that class because of inventory changes during the year. In addition, the shipments data do not reflect the output of products produced and used for further processing in the same plant.

Included in value of shipments are: All items made by or for each establishment from materials owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment; receipts for contract work; and receipts for such miscellaneous activities as sale of scrap and refuse, installation work by plant employees, research and development, and repair work. The net selling value of products made in one plant on a contract basis from materials owned by others was reported by the plant providing the materials. The value of products bought and resold without further processing (merchandising) was reported separately and is included in the value of shipments totals for each industry, but is not included in product class totals.

For multi-unit companies, the value of products transferred to other establishments of the same company (i.e., other manufacturing plants, separate sales branches, or retail stores) was tabulated as though each establishment were a separate economic unit. Included in "value of interplant transfers within the company" are not only the direct costs of production but also a reasonable portion of "all other costs" (including company overhead) and profit.

Capital Expenditures: For establishments in operation and establishments under construction but not yet in operation, these data include expenditures for (a) permanent additions and major alterations to manufacturing establishments, and (b) new machinery and equipment used for replacement purpose and additions to plant capacity, if these are of the type for which depreciation accounts are ordinarily maintained.

These totals exclude that portion of expenditures for new facilities and equipment leased from non-manufacturing concerns, new facilities owned by the Federal Government but operated under contract by private companies, and plant and equipment furnished to the manufacturer by communities and organizations. Expenditures for used plant and equipment, expenditures for land, and costs of maintenance and repairs charged as current operating expense are also omitted.

Value Added per Dollar of Wages: Computed by dividing "wages" into "value added." The resulting ratio measures the relative importance of "wages" to other components of value added.

Wages per Production Worker Man-Hour: Computed by dividing "man-hours" into "wages." The resulting dollar figure is a rough measure of average hourly earnings. It is not a measure of the wage rate since "wages" includes premium payments for overtime as well as vacation and sick leave pay, bonuses, etc.

The definitions of shipments and employment given above also apply to tables 4 and 6 which show employment size and geographic distributions of plants in each industry.

Table 2 presents product import, export, and shipment data and computed ratios of exports as a percent of shipments and imports to new supply (shipments plus imports). Table 7 presents product shipments at a more detailed level than is shown in table 2. The following definitions of terms apply to these tables.

Value of Shipments: On a "product" basis represents the total value of shipments of classes of products, wherever made. They include not only shipments of these products by the industry in which they are primary, but also shipments as secondary products, by establishments in other manufacturing industries.

Dollar amounts shown are the received or receivable net selling values, f.o.b. plant, after discounts and allowances and excluding freight charges and excise taxes. However, where the products are customarily delivered by the manufacturing establishment (e.g., bakery products, fluid milk, and soft drinks), the value of shipments is based on the delivered price of goods.

There is a *very important* distinction between the industry and product value of shipments. This distinction is reflected at the four-digit level in industry table 1 and in product table 2. The difference is accounted for by the fact that the industry shipments are based on total shipments of establishments classified in an industry and therefore include not only shipments of primary products of that industry but also shipments of other products and other receipts from contract work, resales, etc. The product shipments represent only shipments of primary products, including those made by establishments not in the industry to which the products are primary.

Imports: The dollar value shown for imports is defined ordinarily as the market value in the

foreign country and excludes U.S. import duties, transportation, insurance and similar costs. In some cases, imports may be valued at the "American selling price." In practice, only the values reported for imports subject to an ad valorem rate of duty (approximately 10 to 15 percent of U.S. imports) tend to conform to this definition. For other imports, the reported values may inadvertently include ocean freight or related costs.

Exports: The dollar value of exports is defined at the point of exportation. Included are the selling price, or cost if not sold, and expenditures for freight, insurance, and other costs to the exportation point.

Table 5 presents selected key ratios on each industry, namely investment per employee, specialization ratio, and concentration ratios.

Investment per Employee: Represents the value of all fixed depreciable assets on the books of the establishments classified in the specific industry at the end of the year divided by the average number of production workers in the industry during that year. The values (book value) represent the actual cost of the assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation).

Included in the investment figure used are all building, structures, machinery and equipment for which depreciation reserves are maintained. Excluded are nondepreciable and capital assets such as inventories and intangible assets such as patent rights and royalties.

A more detailed description of gross book value of depreciable assets as used in this publication as "Investment" can be found in the *Annual Survey of Manufactures* publication M65(AS)-6 published by the Bureau of the Census.

Specialization Ratio: Derived by dividing the total output (both primary and secondary products) of the industry's plants into their output of products primary to the industry. The resulting percentage measures the extent to which the industry specializes in making its primary products.

Concentration Ratios: Concentration ratios are measures of the share of total activity or resources of a given segment of the economy accounted for by its largest companies. In table 5, the percentage share of total shipments in 1963 of a given industry accounted for by the 4, 8, 20, and 50 largest firms is shown. These data are developed from reports

submitted by every manufacturing establishment in the United States. Each establishment is classified into the four-digit SIC industry that best describes the principal products of that plant. Shipments data for all establishments operated by the same company within each industry are then totaled. The companies are ranked by shipment values and shipment totals for the 4, 8, 20, and 50 largest companies in each industry calculated. Finally, percentages are computed based on the calculated totals in relation to the industry total.

Taking an example, industry 3571 (Computing and Related Machines), the concentration ratios indicate that in 1963 the four largest companies accounted for 67 percent of the industry's \$2,019 million shipments; the eight largest shipped 80 percent of the total; the 20 largest shipped 92 percent; and the 50 largest shipped 98 percent.

It is important to note that these industry concentration ratios do not measure the proportion of total shipments of *given* products accounted for by large firms. Continuing the above example, the stated percentages do not indicate that 67 percent of the computing and related machines were shipped by the four largest companies. In fact, only 63 percent of such machines were shipped by the four leading firms. Data on the concentration ratios by product are available in table 4 of *Concentration Ratios in Manufacturing Industry, 1963* published by the Bureau of the Census.

In table 6 "Geographic Distribution, 1963," for many industries, data are not presented for some States. This may be due either to the absence of the industry from the particular State or to avoid disclosure of information reported by individual companies. In the latter case, the figures shown for States within a region may not add to the total for the region. The regional total includes the data not shown separately, by State, in order to avoid disclosure.

METHODS OF COMPILATION

Most of the data were collected as part of the *Census of Manufactures* and *Annual Survey of Manufactures* programs. Data for 1958 and 1963, except foreign trade, are based on reports covering all manufacturing establishments, and represent, therefore, the most accurate across-the-board information available on U.S. manufacturing activity. Data for 1959-1962 and 1964-1966 are estimates based upon reports received from a

probability sample of all manufacturing establishments. The estimates obtained from the sample will vary from the totals that would have been obtained from a complete canvass of all manufacturing establishments. The relative magnitude of the sampling variation is indicated in the *Annual Survey of Manufactures* publications under the caption "standard error of estimate." These standard errors are not shown in this report. However, where the standard error of estimate is 15 percent or more, for industry data the figures are indicated as not available (N.A.) and in the case of product classes an asterisk (*) preceding the data is used to identify years in which the standard error is 15 percent or more.

In using the time series on industries or product classes, it is important to note that both the data in any given year other than 1958 or 1963 as well as the year-to-year changes will be influenced in part by sampling variability.

Import and export data may be affected in some commodity areas by the fact that low valuation transactions are not included. Commodity information is not collected for individual import and export shipments valued under \$100 or for imports on informal entries. Informal entries, by definition, contain only items valued at not more than \$250. This does not seriously understate the published data.

Another problem with foreign trade data arises from the fact that in many cases the classification and valuation of products to be imported or exported is done basically by the importer, exporter, or a designated representative. Inaccuracies, particularly with respect to export data, may occur through errors in classification.

PRICE CHANGES

In using time series based on dollar valuation, it should be remembered that none of the data have been adjusted for changes in prices. Therefore, the real growth in shipments for a given item, for example, during any period may be understated or overstated relative to other products or items.

CHANGES IN PRODUCT MIX

Although the classification of industry and product statistics presented in this publication changed little during the period covered, there were some substantial shifts in the relative im-

portance of products within industries or product classes. The characteristics of an industry may have changed substantially during the 1958-1966 period as a result of such changes in the product mix. Related changes in types of processes or materials used may also significantly affect the meaningful comparison of an industry or product class over time. For analysis of changes in product mix, data on individual products are available on a continuing basis for many products from the *Current Industrial Reports* series of the Bureau of the Census and for all products in years for which a complete *Census of Manufactures* is conducted.

DUPLICATION IN SHIPMENTS DATA

The value of shipments data shown in this publication may contain some duplication. This occurs because the shipments of one plant become the "materials" of another plant. For example, where parts are classified with the equipment of which they are part of, shipments of the parts by parts manufacturers to equipment manufacturers would be double counted.

COMPARING EXPORTS, IMPORTS, AND SHIPMENTS

Caution should be used in comparing product class shipments with imports and/or exports as reported in table 2. As was mentioned earlier, the methods of valuation used are substantially different. Shipments are valued at f.o.b. plant, exports at f.o.b. port of exportation, and imports at f.o.b. port of exportation. Other reasons for using caution in comparing shipments, export and imports include:

(a) Shipments as described above may include duplication that would overstate their value in relation to exports or imports.

(b) Shipments in some areas are classified in not-specified-by-kind classes which can therefore understate shipments in other areas.

(c) Shipments are subject to sampling variability in non-Census years and imports and particularly exports may be subject to error due to reporting procedures used.

(d) Used commodities are included in exports and imports thereby slightly overstating these data relative to shipments.

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